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Programmable Logic Controller

XGT Analog Input Module

XGT Series

User's Manual

XGF-AD16A

Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

LS Industrial Systems

Safety Instructions

Before using the product …

For your safety and effective operation, please read the safety instructions thoroughly before using the product. Safety Instructions should always be observed in order to prevent accident or risk with the safe and proper use the product.

Instructions are divided into “Warning” and “Caution”, and the meaning of the terms is as follows.

⚠ **Warning**	This symbol indicates the possibility of serious injury or death if some applicable instruction is violated
⚠ **Caution**	This symbol indicates the possibility of severe or slight injury, and property damages if some applicable instruction is violated

Moreover, even classified events under its ⚠ caution category may develop into serious accidents relying on situations. Therefore we strongly advise users to observe all precautions properly just like warnings.

The marks displayed on the product and in the user’s manual have the following meanings.

Be careful! Danger may be expected.

Be careful! Electric shock may occur.

The user’s manual even after read shall be kept available and accessible to any user of the product.

Safety Instructions

Safety Instructions for design process

⚠Warning

1. **Please install a protection circuit on the exterior of PLC so that the whole system may operate safely regardless of failures from external power or PLC.** Any abnormal output or operation from PLC may cause serious problems to safety in whole system.
   (1) Install protection units on the exterior of PLC like an interlock circuit that deals with opposite operations such as emergency stop, protection circuit, and forward/reverse rotation or install an interlock circuit that deals with high/low limit under its position controls.
   (2) If any system error (watch-dog timer error, module installation error, etc.) is detected during CPU operation in PLC, all output signals are designed to be turned off and stopped for safety. However, there are cases when output signals remain active due to device failures in Relay and TR which can't be detected. Thus, you are recommended to install an addition circuit to monitor the output status for those critical outputs which may cause significant problems.
2. **Never overload more than rated current of output module nor allow to have a short circuit**. Over current for a long period time may cause a fire .
3. **Never let the external power of the output circuit to be on earlier than PLC power**, which may cause accidents from abnormal output or operation.
4. **Please install interlock circuits in the sequence program for safe operations in the system when exchange data with PLC or modify operation modes using a computer or other external equipments** Read specific instructions thoroughly when conducting control operations with PLC.

Safety Instructions

Safety Instructions for design process

⚠ Caution

I/O signal or communication line shall be wired at least 100mm away from a high-voltage cable or power line. Fail to follow this instruction may cause malfunctions from noise

Safety Instructions on installation process

⚠ Caution

1. **Use PLC only in the environment specified in PLC manual or general standard of data sheet.** If not, electric shock, fire, abnormal operation of the product may be caused.
2. **Before install or remove the module, be sure PLC power is off.** If not, electric shock or damage on the product may be caused.
3. **Be sure that every module is securely attached after adding a module or an extension connector.** If the product is installed loosely or incorrectly, abnormal operation, error or dropping may be caused. In addition, contact failures under poor cable installation will be causing malfunctions as well.
4. **Be sure that screws get tighten securely under vibrating environments.** Fail to do so will put the product under direct vibrations which will cause electric shock, fire and abnormal operation.
5. **Do not come in contact with conducting parts in each module**, which may cause electric shock, malfunctions or abnormal operation.

Safety Instructions

Safety Instructions for wiring process

⚠ Warning

1. **Prior to wiring works, make sure that every power is turned off.** If not, electric shock or damage on the product may be caused.
2. **After wiring process is done, make sure that terminal covers are installed properly before its use.** Fail to install the cover may cause electric shocks.

⚠ Caution

1. **Check rated voltages and terminal arrangements in each product prior to its wiring process.** Applying incorrect voltages other than rated voltages and misarrangement among terminals may cause fire or malfunctions.
2. **Secure terminal screws tightly applying with specified torque.** If the screws get loose, short circuit, fire or abnormal operation may be caused. Securing screws too tightly will cause damages to the module or malfunctions, short circuit, and dropping.
3. **Be sure to earth to the ground using Class 3 wires for FG terminals which is exclusively used for PLC**. If the terminals not grounded correctly, abnormal operation or electric shock may be caused.
4. **Don't let any foreign materials such as wiring waste inside the module while wiring,** which may cause fire, damage on the product or abnormal operation.
5. **Make sure that pressed terminals get tighten following the specified torque. External connector type shall be pressed or soldered using proper equipments.**

Safety Instructions

Safety Instructions for test-operation and maintenance

⚠ Warning

1. **Don't touch the terminal when powered**. Electric shock or abnormal operation may occur.
2. **Prior to cleaning or tightening the terminal screws, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
3. **Don't let the battery recharged, disassembled, heated, short or soldered**. Heat, explosion or ignition may cause injuries or fire.

⚠ Caution

1. **Do not make modifications or disassemble each module.** Fire, electric shock or abnormal operation may occur.
2. **Prior to installing or disassembling the module, let all the external power off including PLC power.** If not, electric shock or abnormal operation may occur.
3. **Keep any wireless equipment such as walkie-talkie or cell phones at least 30cm away from PLC**. If not, abnormal operation may be caused.
4. **When making a modification on programs or using run to modify functions under PLC operations, read and comprehend all contents in the manual fully.** Mismanagement will cause damages to products and accidents.
5. **Avoid any physical impact to the battery and prevent it from dropping as well.** Damages to battery may cause leakage from its fluid. When battery was dropped or exposed under strong impact, never reuse the battery again. Moreover skilled workers are needed when exchanging batteries.

Safety Instructions

Safety Instructions for waste disposal

⚠ Caution

- **Product or battery waste shall be processed as industrial waste.**
  The waste may discharge toxic materials or explode itself.

Revision History

Version	Date	Remark	Revised Page
V 1.0	2008. 5	First edition	-
V 1.1	2009. 6	Add About User's Manual	-
		Add Configuration and Function of Internal Memory (For XGI,XGR)	CH7
		Add Programming (For XGI,XGR)	CH8
		Fix Troubleshooting, CH7→CH9	CH9
V 1.2	2009. 9	Add function holding last value and alarm function	1-4 2-6, 8~13, 16, 21, 22 5-2~4, 7, 13 6-1, 6, 9 7-2, 4 8-1, 6, 9

※ The number of User's manual is indicated right part of the back cover.

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Thank you for purchasing PLC of LS Industrial System Co.,Ltd.
Before use, make sure to carefully read and understand the User's Manual about the functions, performances, installation and programming of the product you purchased in order for correct use and importantly, let the end user and maintenance administrator to be provided with the User's Manual.

The User's Manual describes the product. If necessary, you may refer to the following description and order accordingly. In addition, you may connect our website (http://eng.lsis.biz/) and download the information as a PDF file.

Relevant User's Manuals

Title	Description
XG5000 User's Manual (for XGK, XGB)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGK, XGB CPU
XG5000 User's Manual (for XGI, XGR)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGI, XGR CPU
XGK/XGB Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGK, XGB CPU.
XGI/XGR/XEC Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGI, XGR,XEC CPU.
XGK CPU User's Manual (XGK-CPUA/CPUE/CPUH/CPUS/CPUU)	XGK-CPUA/CPUE/CPUH/CPUS/CPUU user manual describing about XGK CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard
XGI CPU User's Manual (XGI-CPUU/CPUH/CPUS)	XGI-CPUU/CPUH/CPUS user manual describing about XGI CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard
XGR redundant series User's Manual	XGR- CPUH/F, CPUH/T user manual describing about XGR CPU module, power module, extension drive, base, IO module, specification of extension cable and system configuration, EMC standard

Current XGF-AD16A manual is written based on the following version.

Related OS version list

Product name	OS version
XGK-CPUH, CPUS, CPUA, CPUE, CPUU	V3.0
XGI-CPUU, CPUH, CPUS	V2.1
XGR-CPUH/F, CPUH/T	V1.3
XG5000(XG-PD)	V3.0

◎ Contents ◎

Chapter 1 Introduction ..... 1-1 ~ 1-4

1.1 Characteristics 1-1
1.2 Terminology 1-2
1.2.1 Analog Quantity - A 1-2
1.2.2 Digital Quantity - D 1-2
1.2.3 Characteristics of analog/digital conversion 1-3
1.3 New Functions 1-4

Chapter 2 Specifications ..... 2-1 ~ 2-22

2.1 General Specifications 2-1
2.2 Performance Specifications 2-2
2.3 Respective Designations and Functions 2-4
2.3.1 Analog input module 2-4
2.4 Characteristics of I/O Conversion 2-5
2.4.1 I/O characteristics of analog input module 2-6
2.4.2 Accuracy 2-15
2.5 Functions of Analog Input Module 2-16
2.5.1 Sampling processing 2-16
2.5.2 Average processing 2-17
2.5.3 Input disconnection detection function 2-19
2.5.4 Hold last value (Dedicated for current input) 2-21
2.5.5 Alarm function 2-21

Chapter 3 Installation and Wiring ..... 3-1 ~ 3-4

3.1 Installation 3-1
3.1.1 Installation environment 3-1
3.1.2 Precautions for handling 3-1
3.2 Wiring 3-2
3.2.1 Precautions for wiring 3-2

3.2.2 Wiring examples 3-2

Chapter 4 Operation Setting ..... 4-1 ~ 4-20

4.1 Operation Procedures 4-1
4.2 Operation Parameters Setting 4-2
4.2.1 Settings 4-2
4.2.2 How to use [I/O Parameters] 4-2
4.3 Special Module Monitoring Functions 4-8
4.4 Precautions 4-9
4.5 Special Module Monitoring 4-10
4.5.1 Start of [Special Module Monitoring] 4-10
4.5.2 How to use [Special Module Monitoring] 4-10
4.6 Register U Devices 4-14
4.6.1 Register U devices 4-14
4.6.2 Save variables 4-16
4.6.3 View variables 4-17

Chapter 5 Configuration and Function of Internal Memory (For XGK) ..... 5-1 ~ 5-13

5.1 Internal Memory Configuration 5-1
5.1.1 I/O area of A/D converted data 5-1
5.1.2 Operation parameters setting area 5-4
5.2 A/D Converted Data I/O Area 5-5
5.2.1 Module READY/ERROR flag 5-5
5.2.2 Run channel flag 5-5
5.2.3 Digital output value 5-5
5.2.4 Flag to detect disconnection 5-6
5.2.5 Flag to request error clear 5-6
5.2.6 Flag to request error clear 5-7
5.3 Operation Parameters Setting Area 5-8
5.3.1 How to specify the channel to use 5-8
5.3.2 How to specify the range of input voltage/current 5-8
5.3.3 How to specify the range of output data 5-9
5.3.4 How to specify average process 5-10
5.3.5 How to specify average value 5-11
5.3.6 Error code 5-12

5.3.7 Hold last value 5-13

Chapter 6 Programming (For XGK) ..... 6-1 ~ 6-9

6.1 Basic Program 6-1
6.1.1 Program example using [I/O Parameter] setting 6-1
6.1.2 Program example using PUT/GET instruction 6-2
6.2 Read/Write of Operation Parameters Setting Area 6-3
6.2.1 Read of operation parameters setting area (GET, GETP instruction) 6-3
6.2.2 Write of operation parameters setting are (PUT, PUTP instruction) 6-4
6.3 Application Program 6-5
6.3.1 Program to sort A/D converted value in size 6-5
6.3.2 Program to output error codes of analog input module to BCD display 6-8

Chapter 7 Configuration and Function of Global variable (For XGI/XGR) ..... 7-1 ~ 7-18

7.1 Global Variable (Data area) 7-1
7.1.1 A/D conversion data IO area configuration 7-1
7.1.2 How to use global variable 7-3
7.2 PUT/GET Function Block use area (Parameter area) 7-11
7.2.1 PUT/GET Function Block use area (Parameter area) 7-11
7.2.2 PUT/GET instruction 7-12
7.2.3 Example using PUT/GET instruction 7-14

Chapter 8 Programming (For XGI/XGR)..... 8-1 ~ 8-9

8.1 Basic Program 8-1
8.1.1 Program example using [I/O parameters] setting 8-1
8.1.2 Program example using PUT/GET instruction 8-3
8.2 Application Program 8-5
8.2.1 Program to sort A/D converted value in size 8-5
8.2.2 Program to output error codes of analog input module to BCD display 8-8

Chapter 9 Troubleshooting ..... 9-1 ~ 9-5

9.1 Error Codes 9-1
9.2 Troubleshooting 9-2
9.2.1 RUN LED blinks 9-2
9.2.2 RUN LED is Off 9-3
9.2.3 CPU module cannot read A/D converted value 9-3
9.2.4 Relationship discordant between analog input value & digital output value ... 9-4
9.2.5 H/W error of A/D conversion module 9-4
9.2.6 Status check of A/D conversion module through XG5000 system monitor 9-4

Appendix Dimension ..... A-1 ~ A-1

Appendix 1 Dimension A-1
Appendix 1.1 Dimension A-1

Chapter 1 Introduction

This user's manual is to describe XGF-AD16A analog input module used as associated with XGT PLC series of CPU module about their specifications, treatment and programming, which will be hereinafter referred to as A/D conversion module.

Analog input module is used to convert analog signal (voltage or current input) from PLC's external device to signed 14-bit binary data of digital value.

1.1 Characteristics

(1) Hybrid input process

16 channel current/voltage input can be processed at one module.

(2) High speed conversion

High speed conversion can be processed through 500 ㎲/channel.

(3) High accuracy

High conversion accuracy of ±0.2 % (ambient temperature of 25 ± 5 ℃) is available.

(4) High resolution of 1/16000

High resolution of 1/16000 can be selected to obtain digital value of high resolution.

(5) Operation parameters setting / monitoring through GUI (Graphical User Interface)

Operation parameters setting which was by using traditional commands is available now by means of [I/O Parameters Setting] for which user interface is reinforced to increase user's convenience. With [I/O Parameters Setting] used, the sequence program can be reduced. In addition, through [Special Module Monitoring] function, A/D conversion value can be easily monitored.

(6) Various formats of digital output data provided

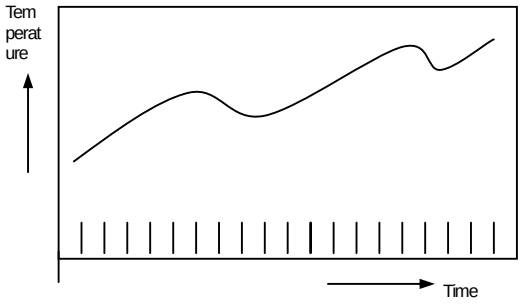
4 formats of digital output data are available as specified below

(a) Unsigned Value: 0 ~ 16000
(b) Signed Value: -8000 ~ 8000
(c) Precise Value: Refer to Chapter 2.2 Display based on analog input range.
(d) Percentile Value: 0 ~ 10000

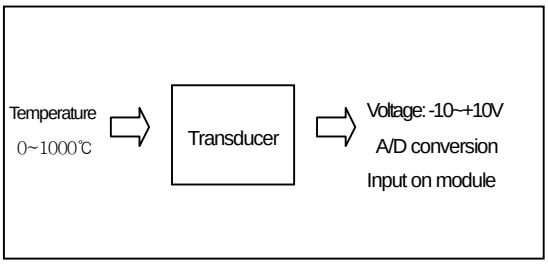
(7) Input disconnection detection function

This function is used to detect the disconnection of input circuit when 1 ~ 5 V, 4 ~ 20 mA of analog input signal range is used.

1.2 Terminology



[Fig. 1.1] Analog Quantity

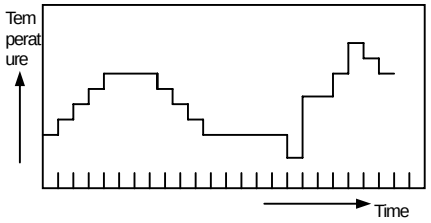


[Fig. 1.2] Example of Transducer

1.2.1 Analog Quantity - A

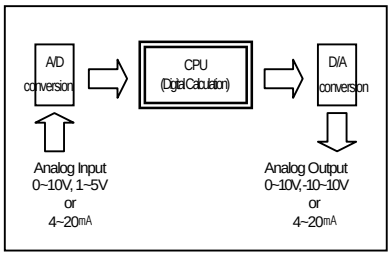
What is displayed in numerical value with continuous physical quantity is called Analog Quantity. Since the size of analog changes continuously, any middle value can be taken from it in which general physical quantities such as voltage, current, temperature, speed, pressure and flow are included. For example, temperature can change continuously together with time as shown in Fig. 1.1. Since the changing temperature can not be input directly on Analog input module, it shall be input on Analog input module through the transducer converting identical analog quantity of input signal to electric signal.

1.2.2 Digital Quantity - D



[Fig. 1.3 Digital Quantity]

What is displayed in data or numerical value such as 0, 1, 2 and 3 with data or physical quantity is called Digital Quantity. Digital in (Fig. 1.3) stands for electronic technology to create, save and process the data through 0 and 1 only. Accordingly, the data sent or saved with digital technology will be displayed in a string of 0 and 1 continuously used. For example, On and Off signal can be displayed in a digital quantity of 0 and 1. BCD and binary value is also the digital quantity.

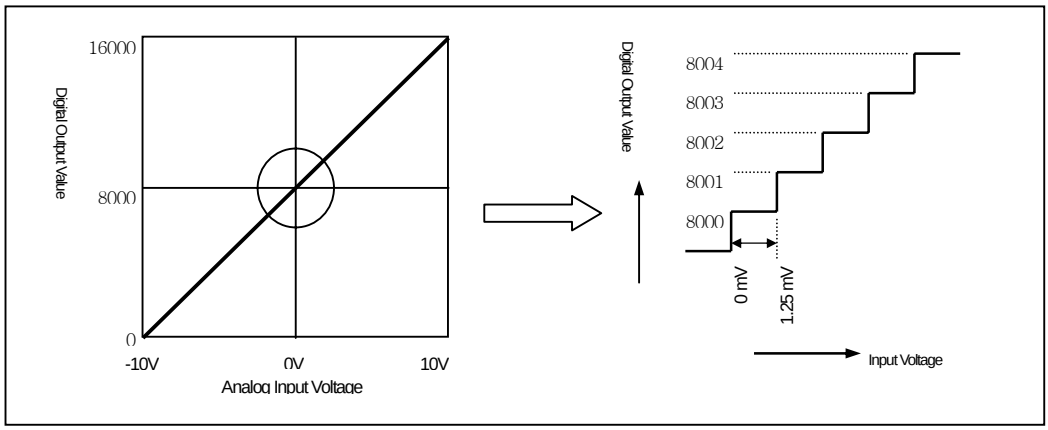


[Fig. 1.4] Process in PLC

Analog quantity can not be directly input on PLC CPU for calculation. Thus, convert analog quantity to digital quantity as in Fig. 1.4 so to input on PLC CPU, which will be executed by Analog input module.
In addition, in order to output the analog quantity outward, convert PLC CPU's digital quantity to analog quantity, which will be executed by D/A conversion module.

1.2.3 Characteristics of analog/digital conversion

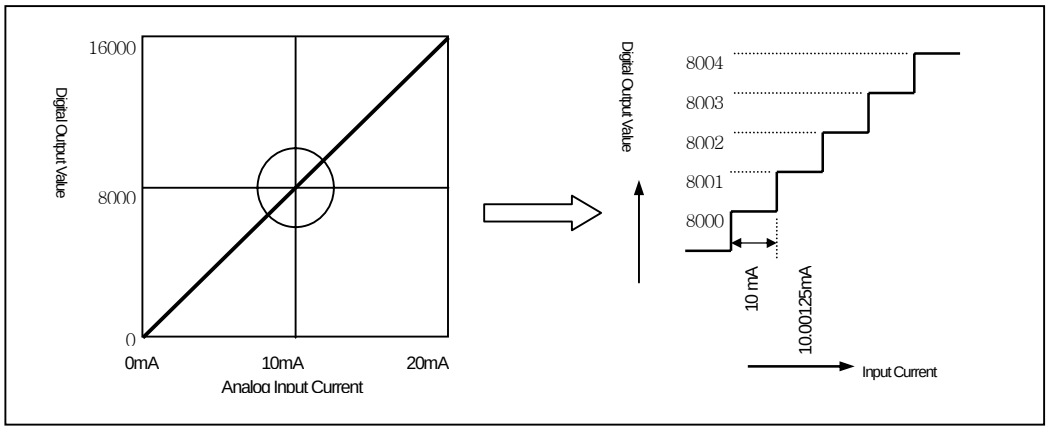
(1) Voltage Input



[Fig. 1.5] Characteristics of A/D conversion (Voltage Input)

Analog input module is used to convert analog electric signal input from the external device to digital quantity. Analog input signal converted to digital quantity can be calculated in PLC CPU. If analog input range of -10 ~ 10 V is used in voltage type of Analog input module, -10 V of analog input quantity will be output with digital value of 0, and 10 V of analog input quantity will be output with digital value of 16000, where consequently, analog input of 1.25 ㎷ is equivalent to digital value of 1. (Fig. 1.5)

(2) Current Input



[Fig. 1.6] Characteristics of A/D conversion (Current Input)

If analog input range of 0 ~ 20 ㎃ is used in current type of Analog input module, 0 ㎃ of analog input quantity will be output with digital value of 0, and 20 ㎃ of analog input quantity will be output with digital value of 16000, where consequently, analog input of 1.25 μA is equivalent to digital value of 1. (Fig. 1.6)

1.3. New Functions

The new functions of A/D conversion module are as follows.

Item	Description	Module OS version	CPU OS version	Ref.
Hold last value	When input signal exceeds effective range, holds last effective input value.	V1.02	Not related	2.5
Alarm function	When input signal exceeds effective range, relevant alarm flag turns on.	V1.02	XGK V3.2 XGI V3.1 XGR V1.7	2.5

Chapter 2 Specifications

2.1 General Specifications

General specifications of XGT series are as specified in Table 2.1.

[Table 2.1] General Specifications

<table>
<tr><th>No.</th><th>Item</th><th colspan="6">Specifications</th><th>Related standards</th></tr>
<tr><td>1</td><td>Operating temp.</td><td colspan="6">0℃ ~ +55℃</td><td></td></tr>
<tr><td>2</td><td>Storage temp.</td><td colspan="6">-25℃ ~ +70℃</td><td></td></tr>
<tr><td>3</td><td>Operating humidity</td><td colspan="6">5 ~ 95%RH (Non-condensing)</td><td></td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="6">5 ~ 95%RH (Non-condensing)</td><td></td></tr>
<tr><td rowspan="9">5</td><td rowspan="9">Vibration</td><td colspan="6">For discontinuous vibration</td><td></td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td><td>Number</td><td rowspan="9">IEC61131-2</td></tr>
<tr><td>10≤f< 57㎐</td><td colspan="2">-</td><td>0.075mm</td><td rowspan="6">Each 10 times in X,Y,Z directions</td></tr>
<tr><td>57≤f≤150㎐</td><td colspan="2">9.8m/s2(1G)</td><td>-</td></tr>
<tr><td colspan="4">For continuous vibration</td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td></tr>
<tr><td>10≤f< 57㎐</td><td colspan="2">-</td><td>0.035mm</td></tr>
<tr><td>57≤f≤150㎐</td><td colspan="2">4.9m/s2(0.5G)</td><td>-</td></tr>
<tr><td>6</td><td>Shocks</td><td colspan="6">* Max. impact acceleration:147㎨(15G)
* Authorized time :11㎳
* Pulse wave : Sign half-wave pulse (Each 3 times in X,Y,Z directions)</td><td>IEC61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Noise</td><td colspan="3">Square wave impulse noise</td><td colspan="2">±1,500V</td><td>LSIS standard</td></tr>
<tr><td colspan="3">Electrostatic discharging</td><td colspan="2">Voltage : 4kV(contact discharging)</td><td>IEC61131-2
IEC61000-4-2</td></tr>
<tr><td colspan="3">Radiated electromagnetic field noise</td><td colspan="2">27 ~ 500MHz, 10 V/m</td><td>IEC61131-2,
IEC61000-4-3</td></tr>
<tr><td rowspan="2">Fast Transient /burst noise</td><td>Class</td><td>Power module</td><td colspan="2">Digital/ Analog I/O communication interface</td><td rowspan="2">IEC61131-2
IEC61000-4-4</td></tr>
<tr><td>Voltage</td><td>2kV</td><td colspan="2">1kV</td></tr>
<tr><td>8</td><td>Ambient conditions</td><td colspan="6">No corrosive gas or dust</td><td></td></tr>
<tr><td>9</td><td>Operating height</td><td colspan="6">2000m or less</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="6">2 or less</td><td></td></tr>
</table>

Notes

1) IEC (International Electrotechnical Commission):
An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic fields publishes international standards and manages applicable estimation system related with.

2) Pollution level: An index indicating pollution level of the operating environment which decides insulation performance of the devices. For instance, Pollution level 2 indicates the state generally that only non-conductive pollution occurs. However, this state contains temporary conduction due to dew produced.

2.2 Performance Specifications

Performance specifications of Analog input modules are as specified in Table 2.2.

[Table 2.2] Performance Specifications

<table>
<tr><th rowspan="2">Item</th><th colspan="5">Specifications</th></tr>
<tr><th>Voltage</th><th colspan="4">Current</th></tr>
<tr><td>Analog input</td><td>DC 1 ~ 5 V
DC 0 ~ 5 V
DC 0 ~ 10 V
DC -10 ~ 10 V
(Input Resistance: 1 MΩ min.)</td><td colspan="4">DC 4 ~ 20 mA
DC 0 ~ 20 mA
(Input Resistance 250 Ω)</td></tr>
<tr><td>Analog input range setting</td><td colspan="5">►Selecting current/voltage can be set through DIP switch.
► Analog input range can be selected through XG5000 user's (or sequence) program or [I/O parameter].
► Respective input ranges can be set based on channels.</td></tr>
<tr><td>Digital output</td><td colspan="5">(1) Voltage Type
<table>
<tr><th>Analog input / Digital output</th><th>1 ~ 5 V</th><th>0 ~ 5 V</th><th>0 ~ 10 V</th><th>-10 ~ 10 V</th></tr>
<tr><td>Unsigned Value</td><td colspan="4">0 ~ 16000</td></tr>
<tr><td>Signed Value</td><td colspan="4">-8000 ~ 8000</td></tr>
<tr><td>Precise Value</td><td>1000 ~ 5000</td><td>0 ~ 5000</td><td>0 ~ 10000</td><td>-10000 ~ 10000</td></tr>
<tr><td>Percentile Value</td><td colspan="4">0 ~ 10000</td></tr>
</table>
(2) Current Type
<table>
<tr><th>Analog input / Digital output</th><th>4 ~ 20 ㎃</th><th>0 ~ 20 ㎃</th></tr>
<tr><td>Unsigned Value</td><td colspan="2">0 ~ 16000</td></tr>
<tr><td>Signed Value</td><td colspan="2">-8000 ~ 8000</td></tr>
<tr><td>Precise Value</td><td>4000 ~ 20000</td><td>0 ~ 20000</td></tr>
<tr><td>Percentile Value</td><td colspan="2">0 ~ 10000</td></tr>
</table>
► 14-bit binary value (data: 14 bits)
► Format of digital output data can be set through user program or S/W package respectively based on channels.</td></tr>
<tr><td>Max. resolution</td><td colspan="5">
<table>
<tr><th>Analog input range</th><th>Resolution (1/16000)</th><th>Analog input range</th><th>Resolution (1/16000)</th></tr>
<tr><td>1 ~ 5 V</td><td>0.250 mV</td><td rowspan="2">4 ~ 20 ㎃</td><td rowspan="2">1.0 μA</td></tr>
<tr><td>0 ~ 5 V</td><td>0.3125 mV</td></tr>
<tr><td>0 ~ 10 V</td><td>0.625 mV</td><td rowspan="2">0 ~ 20 ㎃</td><td rowspan="2">1.25 μA</td></tr>
<tr><td>-10 ~ 10 V</td><td>1.250 mV</td></tr>
</table>
</td></tr>
<tr><td>Accuracy</td><td colspan="5">±0.2% or less (when ambient temperature is 25 ℃ ±5 ℃)
±0.3% or less (when ambient temperature is 0 ℃ ~ 55 ℃)</td></tr>
<tr><td>Max. conversion speed</td><td colspan="5">500 μs/channel</td></tr>
<tr><td>Absolute max. input</td><td colspan="2">±15 V</td><td colspan="3">±30 ㎃</td></tr>
<tr><td>Analog input points</td><td colspan="5">16 channels/1 module</td></tr>
<tr><td>Insulation method</td><td colspan="5">Photo-coupler insulation between input terminal and PLC power
(no insulation between channels)</td></tr>
<tr><td>Terminal connected</td><td colspan="5">32-point terminal</td></tr>
<tr><td>I/O points occupied</td><td colspan="5">Fixed type: 64 points, Changeable type: 16 points</td></tr>
<tr><td>Internal-consumed current</td><td colspan="5">DC 5 V: 330 ㎃</td></tr>
<tr><td>Weight</td><td colspan="5">115g</td></tr>
</table>

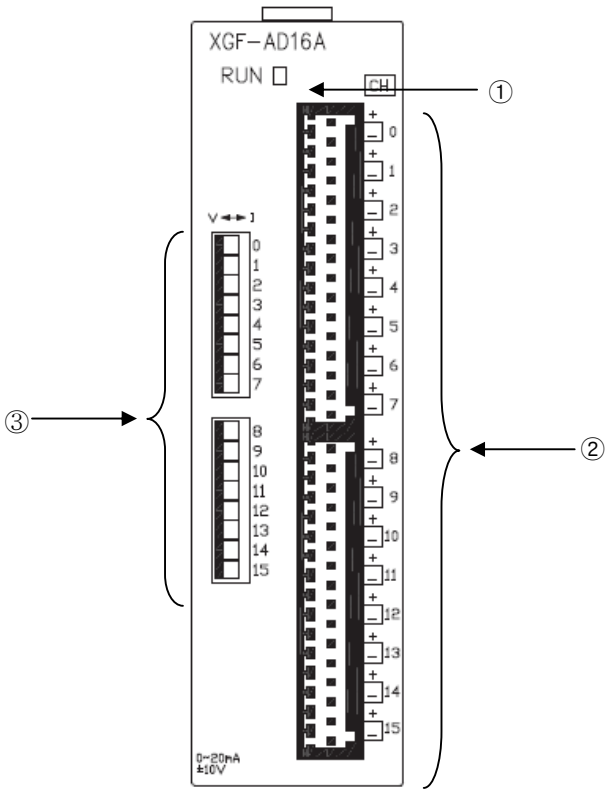
Notes

(1) When analog input module is released from the factory, Offset/Gain value is as adjusted for respective analog input ranges, which is unavailable for user to change.
(2) When analog input module is released from the factory, voltage/current selection switch is selected as current.
(3) Offset Value: Analog input value where digital output value is 0 when digital output format is set to Unsigned Value.
(4) Gain Value: Analog input value where digital output value is 16000 when digital output format is set to Unsigned Value.
(5) In XGR system, you can install it at extension base. Namely, you can't install it at basic base.

2.3 Respective Designations and Functions

Respective designations of the parts are as described below.

2.3.1 Analog input module

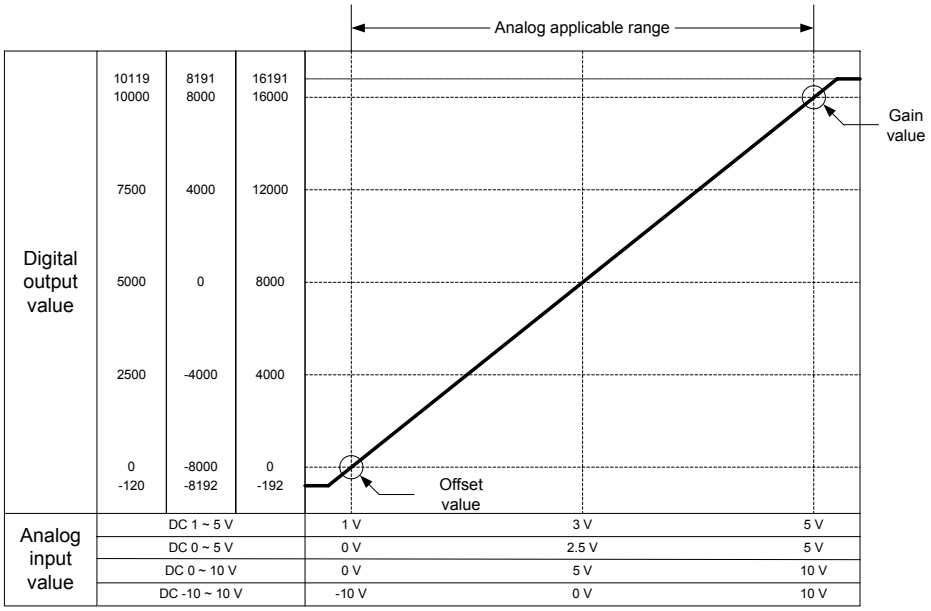


No.	Description
①	RUN LED
	▶ Displays the operation status of analog input module (voltage, current) On: Operation normal Flickering: Error occurs (Refer to 9.1 for more details) Off: DC 5V disconnected, analog input module error
②	Terminal
	▶ Analog input terminal, whose respective channels can be connected with external devices.
③	Voltage/current selection switch
	▶ switch to select voltage/current (left: voltage, right: current)

2.4 Characteristics of I/O Conversion

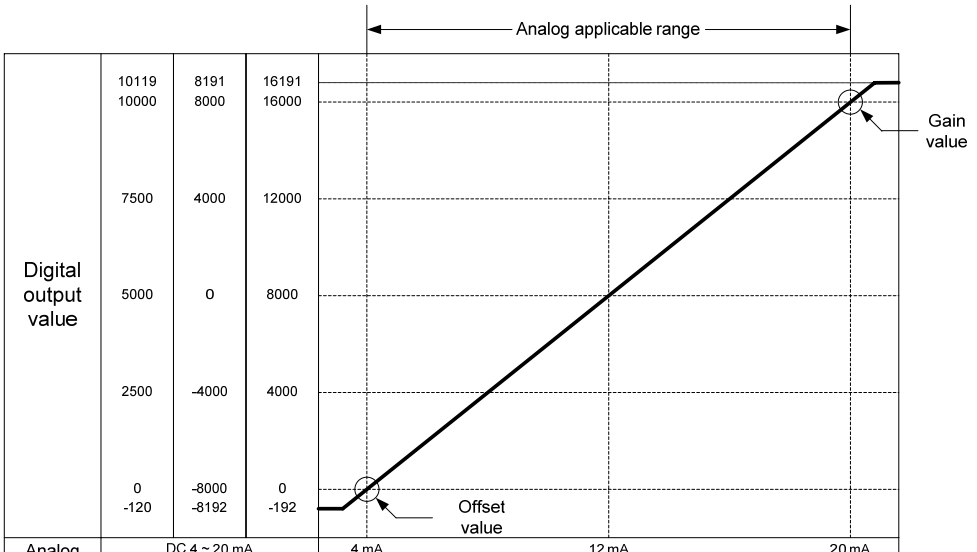
Characteristics of I/O conversion are the inclination connected in a straight line between Offset and Gain values when converting analog signal (voltage or current input) from PLC's external device to digital value. I/O conversion characteristics of analog input modules are as described below.

Voltage input



Analog input value			
DC 1 ~ 5 V	1 V	3 V	5 V
DC 0 ~ 5 V	0 V	2.5 V	5 V
DC 0 ~ 10 V	0 V	5 V	10 V
DC -10 ~ 10 V	-10 V	0 V	10 V

Current input



Analog input value			
DC 4 ~ 20 mA	4 mA	12 mA	20 mA
DC 0 ~ 20 mA	0 mA	10 mA	20 mA

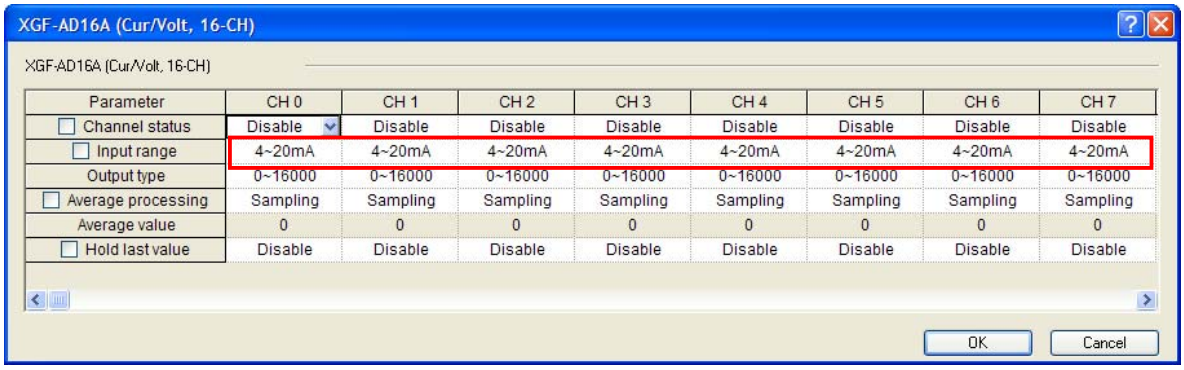
2.4.1 I/O characteristics of analog input module

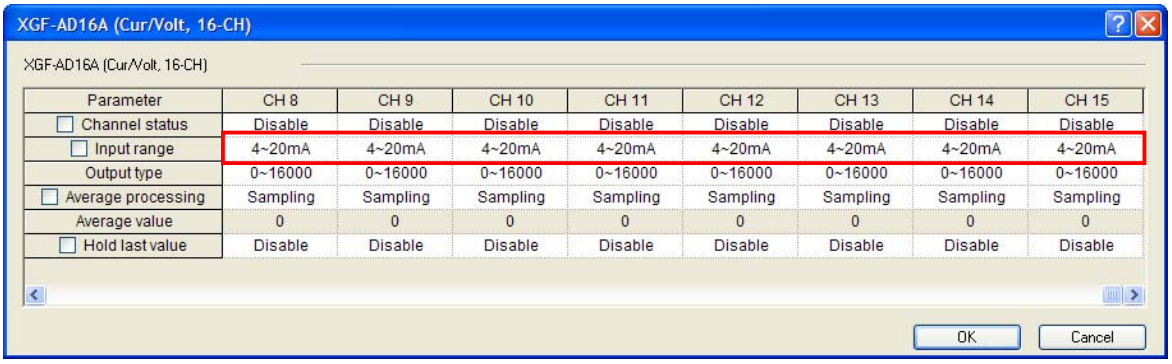
Analog input module is having 16 channels for analog input, where Offset/Gain can not be adjusted by user. Voltage/current input range can be set through user program or [I/O parameter] of XG5000 for respective channels. Output formats of digital data are as specified below;

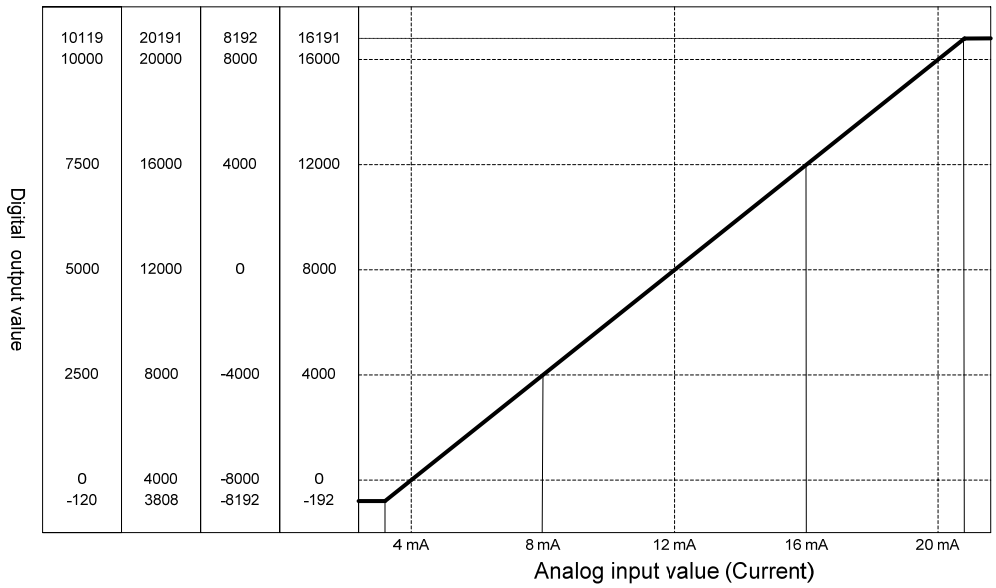
(a) Unsigned Value
(b) Signed Value
(c) Precise Value
(d) Percentile Value

(1) If the range is DC 4 ~ 20 mA

(a) On the XG5000 menu [I/O Parameters Setting], set [Input range] to "4 ~ 20 ㎃".





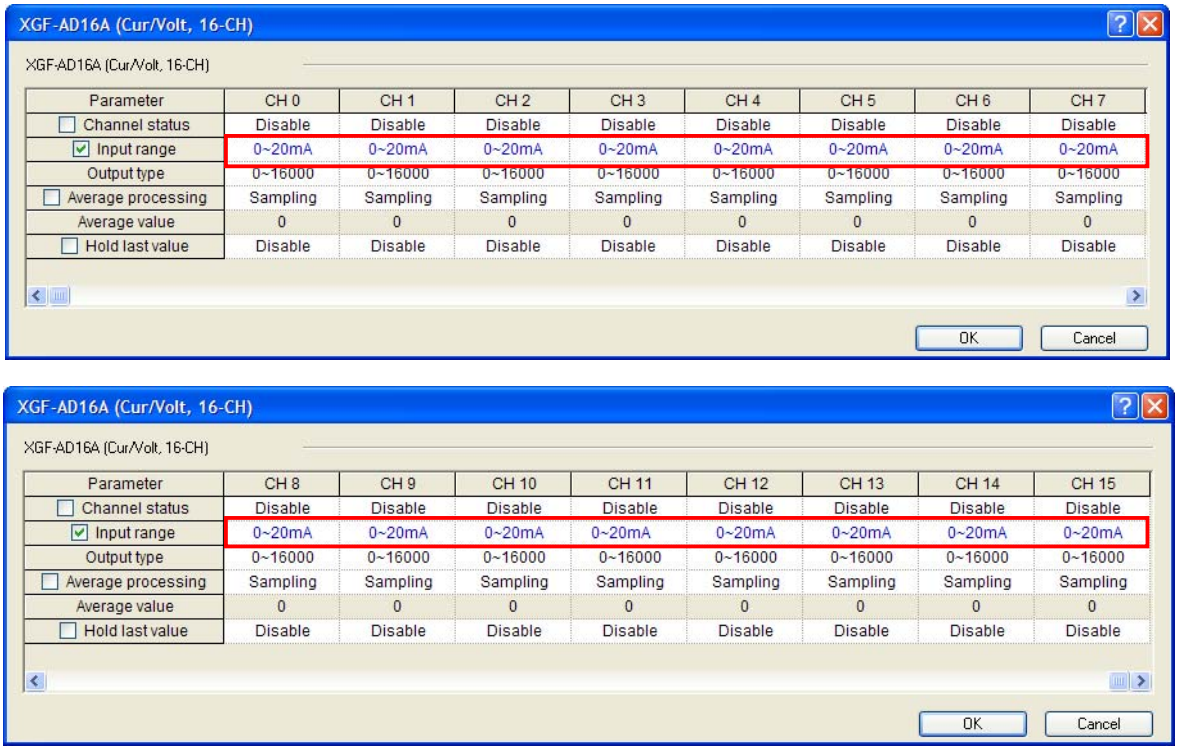


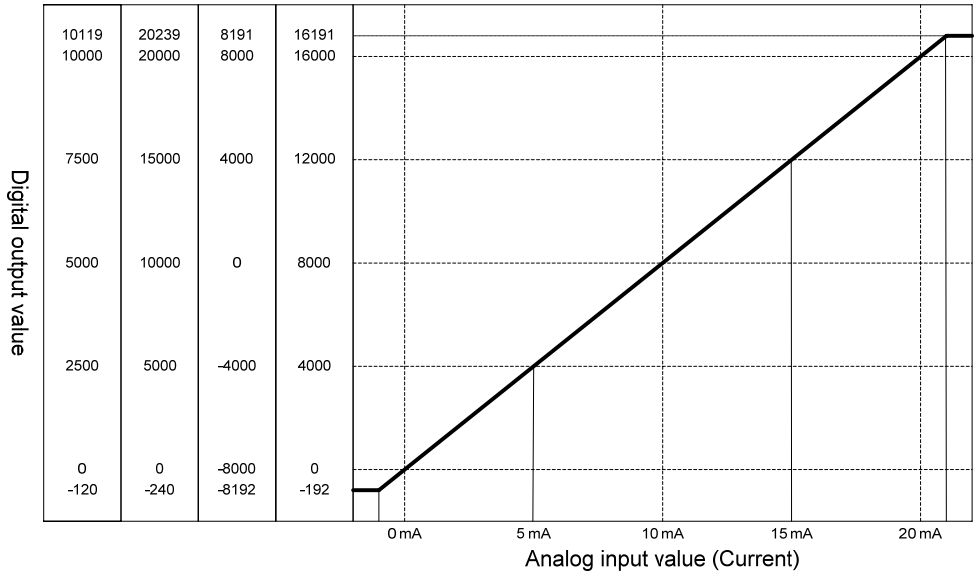
(b) Digital output value for current input characteristics is as specified below.
(Resolution (based on 1/16000): 1 μA)

Digital Output range	Analog input current (mA)						
	3.808	**4**	**8**	**12**	**16**	**20**	**20.191**
Unsigned value (-192 ~ 16191)	-192	0	4000	8000	12000	16000	16191
Signed value (-8192 ~ 8191)	-8192	-8000	-4000	0	4000	8000	8191
Precise value (3808 ~ 20191)	3808	4000	8000	12000	16000	20000	20191
Percentile value (-120 ~ 10119)	-120	0	2500	5000	7500	10000	10119

(2) If the range is DC 0 ~ 20 mA

(a) On the XG5000 menu [I/O Parameters Setting], set [Input range] to "0 ~ 20 ㎃".



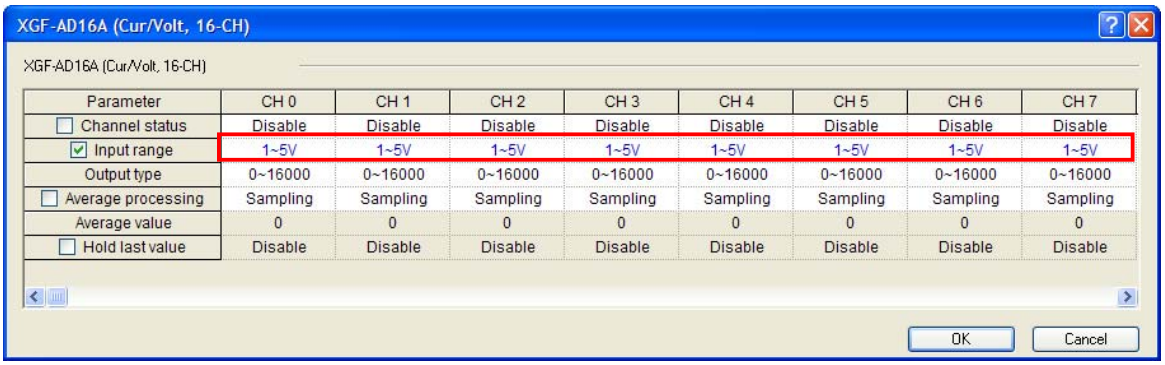


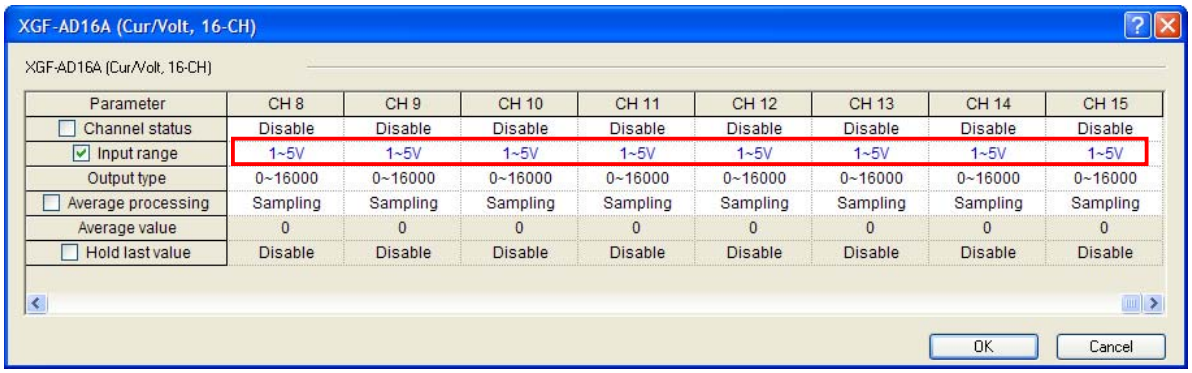
(b) Digital output value for current input characteristics is as specified below.
(Resolution (based on 1/16000): 1.25 μA)

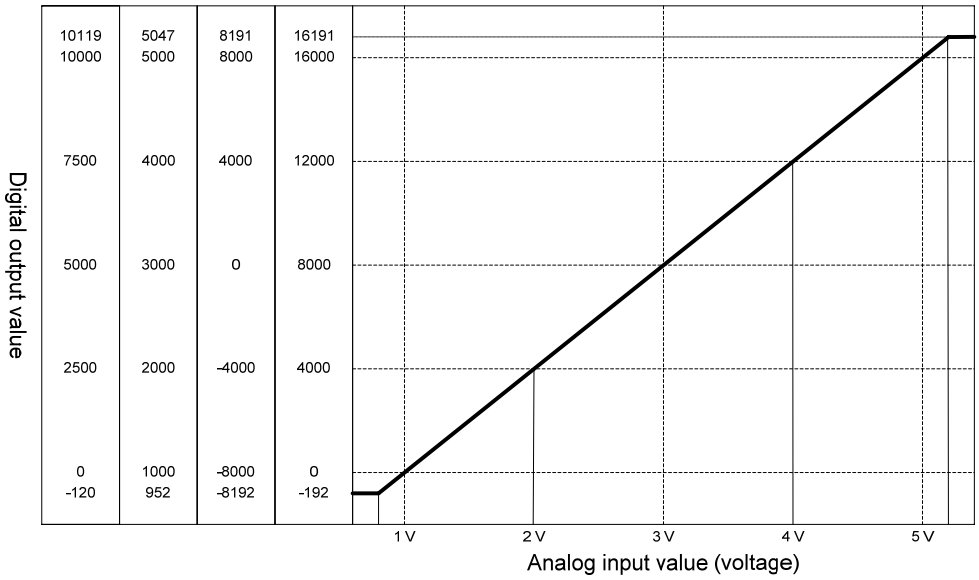
Digital Output range	Analog input current (mA)						
	-0.24	**0**	**5**	**10**	**15**	**20**	**20.23**
Unsigned value (-192 ~ 16191)	-192	0	4000	8000	12000	16000	16191
Signed value (-8192 ~ 8191)	-8192	-8000	-4000	0	4000	8000	8191
Precise value (3808 ~ 20191)	-240	0	5000	10000	15000	20000	20239
Percentile value (-120 ~ 10119)	-120	0	2500	5000	7500	10000	10119

(3) If the range is DC 1 ~ 5 V

(a) On the XG5000 menu [I/O Parameters Setting], set [Input range] to “1 ~ 5 V”.





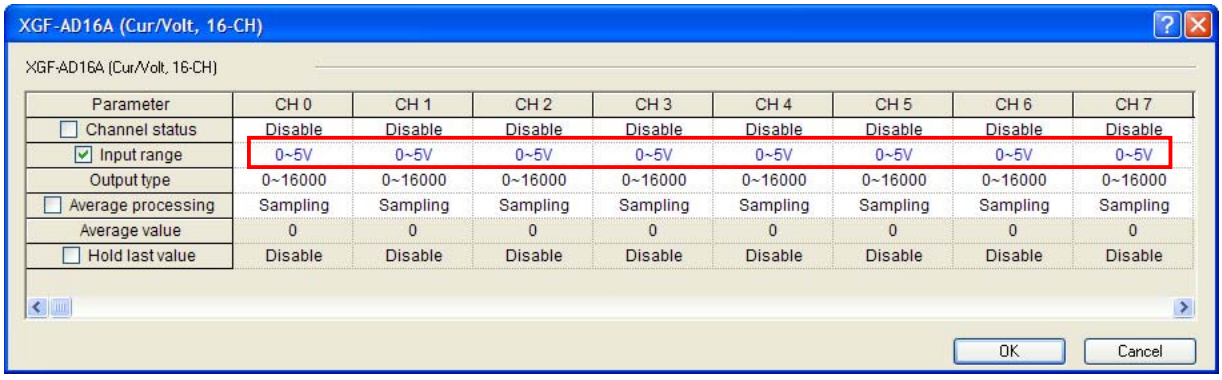


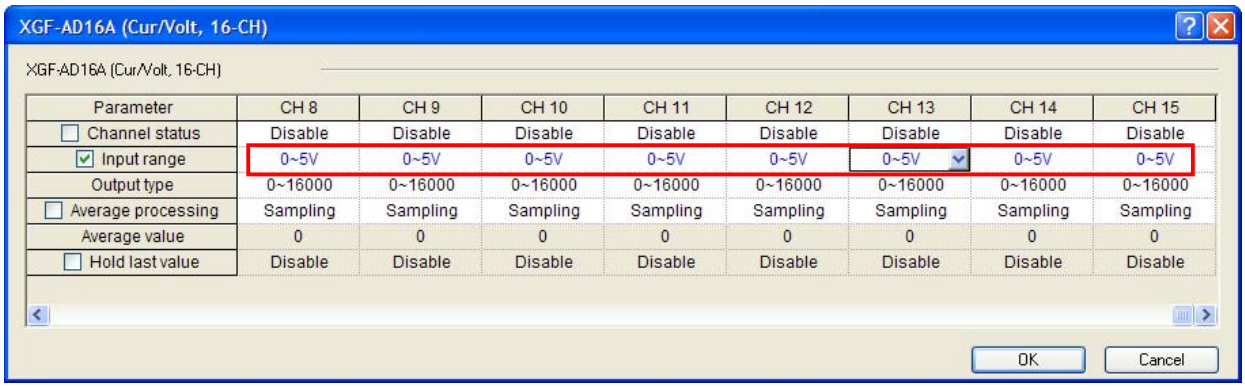
(b) Digital output value for voltage input characteristics is as specified below.
(Resolution (based on 1/16000): 0.25 mV)

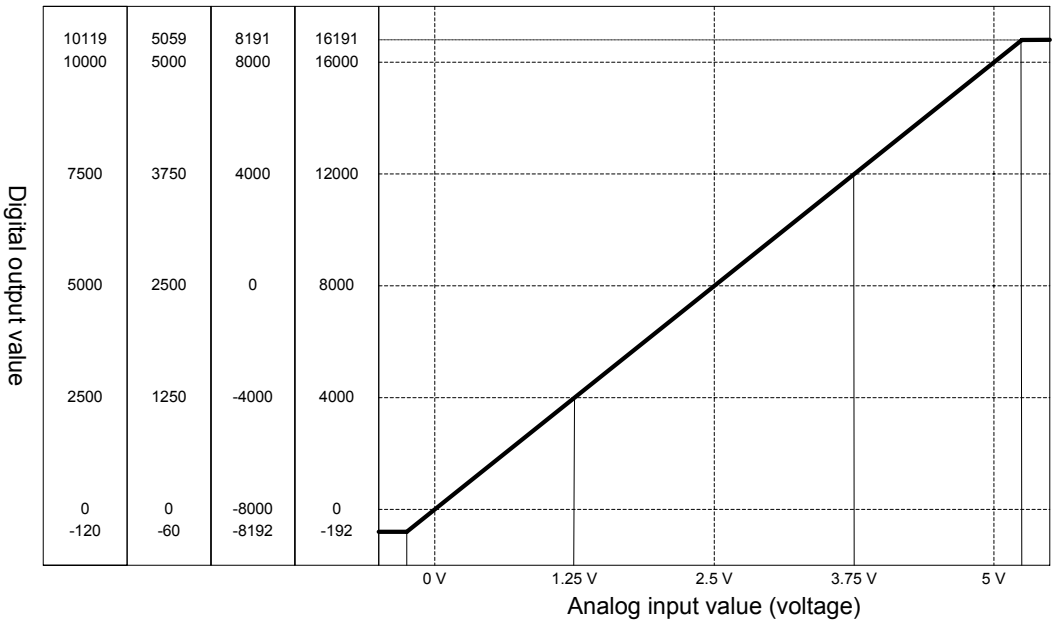
Digital Output range	Analog input voltage (V)						
	0.952	**1**	**2**	**3**	**4**	**5**	**5.047**
Unsigned value (-192 ~ 16191)	-192	0	4000	8000	12000	16000	16191
Signed value (-8192 ~ 8191)	-8192	-8000	-4000	0	4000	8000	8191
Precise value (952 ~ 5048)	952	1000	2000	3000	4000	5000	5047
Percentile value (-120 ~ 10119)	-120	0	2500	5000	7500	10000	10119

(4) If the range is DC 0 ~ 5 V

(a) On the XG5000 menu [I/O Parameters Setting], set [Input range] to"0 ~ 5 V".





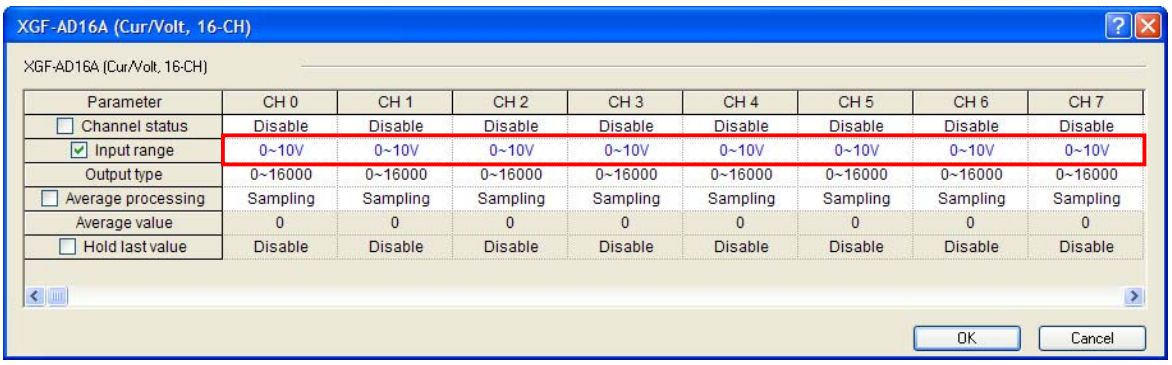


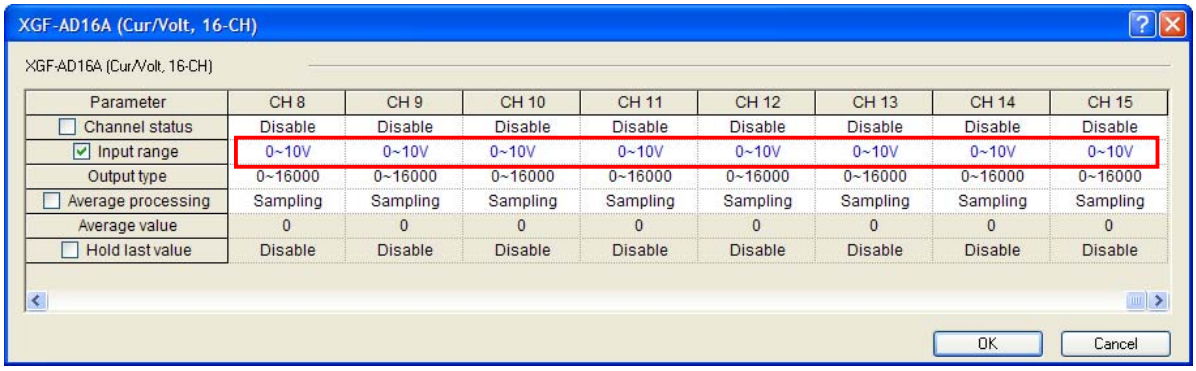
(b) Digital output value for voltage input characteristics is as specified below.
(Resolution (based on 1/16000): 0.3125 mV)

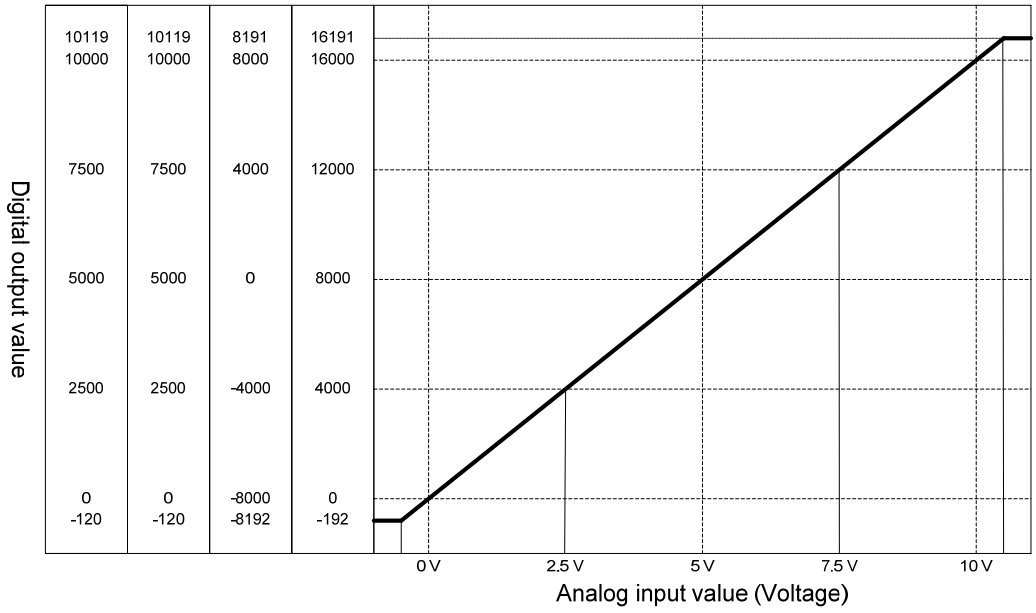
Digital Output range	Analog input voltage (V)						
	-0.06	**0**	**1.25**	**2.5**	**3.75**	**5**	**5.05**
Unsigned value (-192 ~ 16191)	-192	0	4000	8000	12000	16000	16191
Signed value (-8192 ~ 8191)	-8192	-8000	-4000	0	4000	8000	8191
Precise value (-60 ~ 5060)	-60	0	1250	2500	3750	5000	5059
Percentile value (-120 ~ 10119)	-120	0	2500	5000	7500	10000	10119

(5) If the range is DC 0 ~ 10 V

(a) On the XG5000 menu [I/O Parameters Setting], set [Input range] to"0 ~ 10 V".





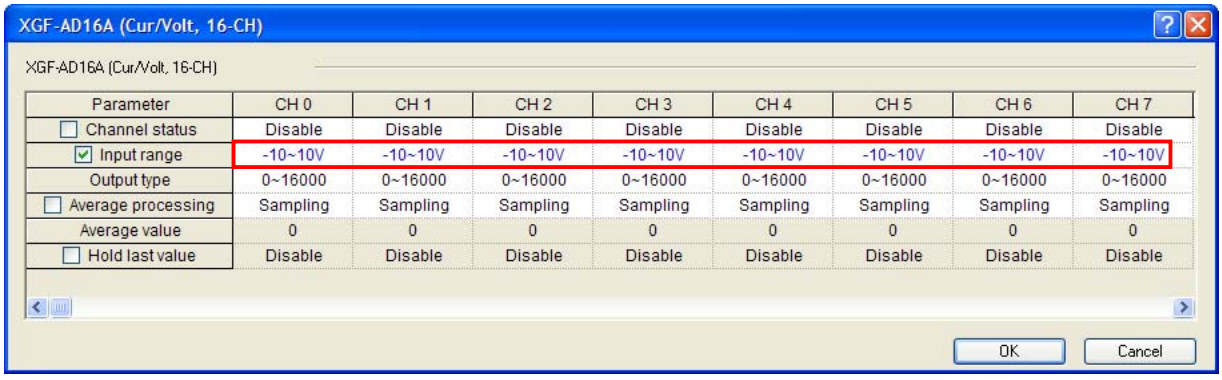


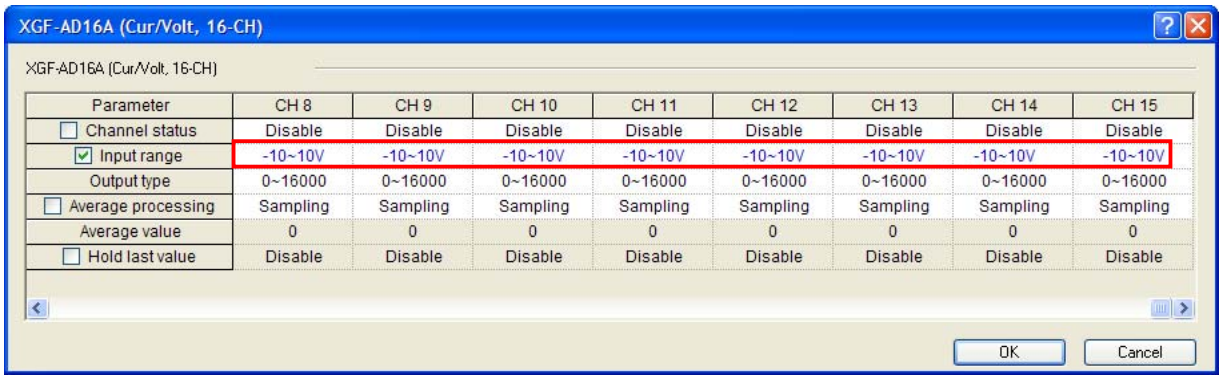
(b) Digital output value for voltage input characteristics is as specified below.
(Resolution (based on 1/16000): 0.625 mV)

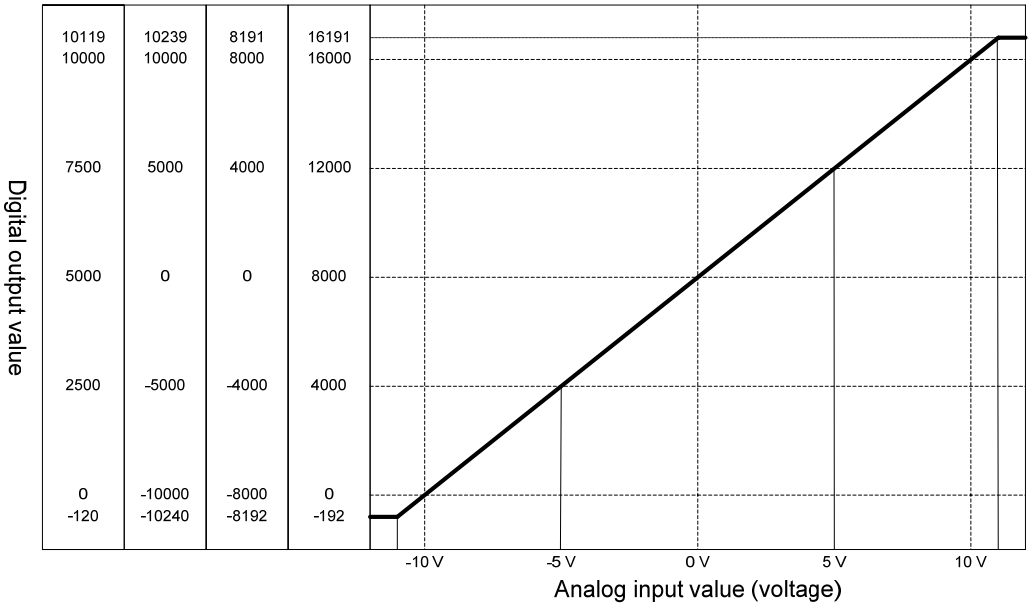
Digital Output range	Analog input voltage (V)						
	-0.12	**0**	**2.5**	**5**	**7.5**	**10**	**10.11**
Unsigned value (-192 ~ 16191)	-192	0	4000	8000	12000	16000	16191
Signed value (-8192 ~ 8191)	-8192	-8000	-4000	0	4000	8000	8191
Precise value (-60 ~ 5059)	-120	0	2500	5000	7500	10000	10119
Percentile value (-120 ~ 10119)	-120	0	2500	5000	7500	10000	10119

(6) If the range is DC-10 ~ 10 V

(a) On the XG5000 menu [I/O Parameters Setting], set [Input range] to "-10 ~ 10 V"







(b) Digital output value for voltage input characteristics is as specified below.
(Resolution (based on 1/16000): 1.25 mV)

Digital Output range	Analog input voltage (V)						
	-10.24	**-10**	**-5**	**0**	**5**	**10**	**10.23**
Unsigned value (-192 ~ 16191)	-192	0	4000	8000	12000	16000	16191
Signed value (-8192 ~ 8191)	-8192	-8000	-4000	0	4000	8000	8191
Precise value (-10240 ~ 10238)	-10240	0	2500	5000	7500	10000	10239
Percentile value (-120 ~ 10119)	-120	0	2500	5000	7500	10000	10119

Notes

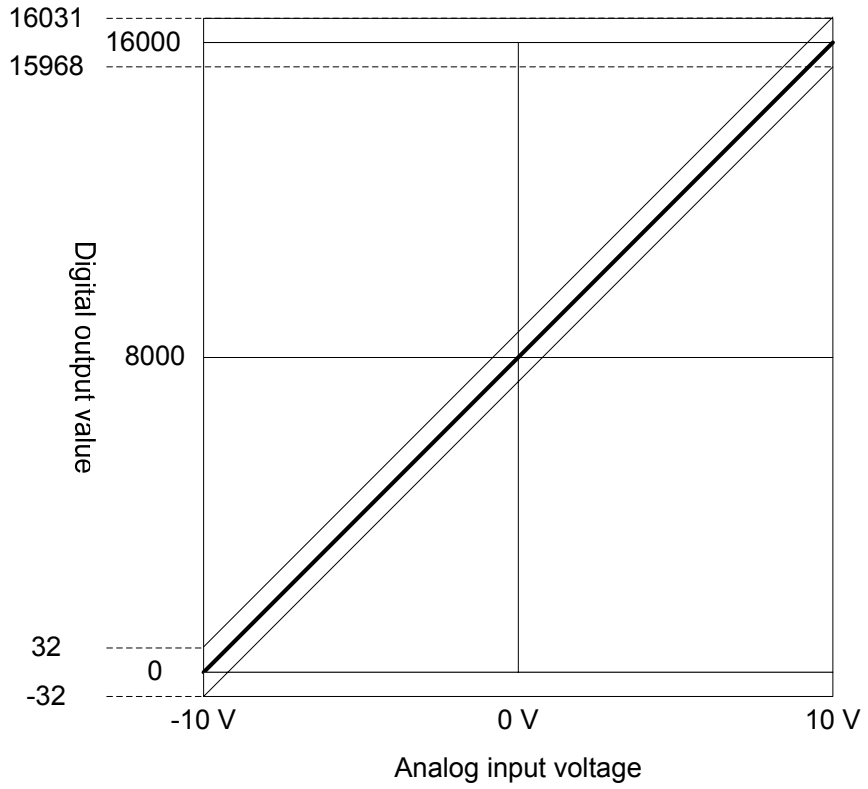
(1) If analog input value exceeding digital output range is input, the digital output value will be kept to be the max. or the min. value applicable to the output range specified. For example, if the digital output range is set to unsigned value (–192 ~ 16191) and the digital output value exceeding 16191 or analog value exceeding –192 is input, the digital output value will be fixed as 16191 or –192.
(2) Offset/Gain setting for analog input module shall not be performed by user.

⚠ Caution

- Voltage and current input shall not exceed ±15 V and ±30 ㎃ respectively. Rising heat may cause defects.

2.4.2 Accuracy

Accuracy of digital output value does not change even if input range is changed. Fig. 2.1 shows the change range of the accuracy at ambient temperature of 25 ± 5 ℃ with analog input range of -10 ~ 10 V selected and digital output type of Unsigned value selected. ±0.2% of error tolerance is acceptable at ambient temperature of 25±5 °C, and ±0.3% at ambient temperature of 0~55°C.



[Figure 2.1] Accuracy (in case of 25 ± 5℃)

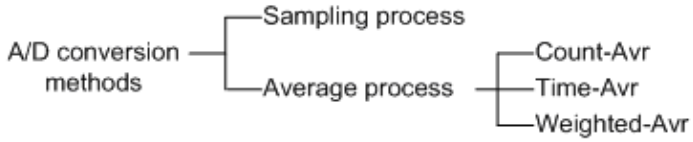
2.5 Functions of Analog Input Module

Functions of Analog input module are as described below in Table 2.3.

[Table 2.3] List of Functions

Function Item	Details
Channel Run/Stop setting	Specify Run/Stop of the channel to execute A/D conversion. If the unused channel is set to Stop, whole Run time can be reduced.
Input voltage/Current range setting	Specify analog input range to be used input ranges available for voltage input, and 2 input ranges for current input
Output data format setting	Specify digital output type 4 output data formats are provided in this module
A/D conversion methods	(1) Sampling processing Sampling process will be performed if A/D conversion type is not specified. (2) Filter processing Used to delay the sudden change of input value. (3) Average processing Outputs average A/D conversion value based on frequency or time.
Function to detect input disconnected	If analog input with the range of 1 ~ 5 V (4 ~ 20 ㎃) is disconnected, user program will detect it.
Hold last value	(1) This function is supported at current input (4~20mA, 0~20mA) (2) When input signal exceeds the effective range, holds the last effective value.
Alarm function	(1) Separate setting is not necessary (2) When input signal exceeds the effective range, relevant flag turns on to let the user know

There are two A/D conversion methods, sampling processing, average processing



2.5.1 Sampling processing

It collects analog input sign through general A/D conversion processing at a specific interval so to convert to digital. The time required for A/D conversion of analog input sign till saved on the memory depends on the number of channels used.

(Processing time) = (Number of Channels used) X (Conversion speed)

Ex.) If the number of channels used is 3, its process time will be

(3) X (500 μs) = 1500 μs

Sampling is to calculate the sampling value of continuous analog sign at a specific interval.

2.5.2 Average processing

This process is used to execute A/D conversion of the channel designated for specified frequency or for specified time and save the average of the accumulated sum on memory. Average processing option and time/frequency value can be defined through user program or I/O parameters setting for respective channels

(1) What is the average processing used for

This process is used for A/D conversion of abnormal analog input sign such as noise to a value near to normal analog input sign.

(2) Average processing type

Average processing type is of time average, count average and weighted-average.

(a) Time average processing

1) Setting range: 16 ~ 16000 (ms)

2) Average processing count within specified time is decided based on the number of channels used.

$$\text{Average processing count} = \frac{\text{Setting time}}{(\text{Number of Channels used}) \times (\text{Conversion Speed})}$$

Ex.1) Channels used: 1, setting time: 16000 ms

$$\text{Average processing count} = \frac{16000\ ms}{1 \times 0.5\ ms} = 32000\ times$$

Ex.2) Channels used: 8, setting time: 16 ms

$$\text{Average processing count} = \frac{16\ ms}{8 \times 0.5\ ms} = 4 times$$

*1: If setting value of time average is not specified within 16 ~ 16000, RUN LED blinks at an interval of 1 second. In order to set RUN LED to On status, reset the setting value of time average within 16 ~ 16000 and then convert PLC CPU from STOP to RUN. Be sure to use request flag of error clear (UXY.19.0) to clear the error through online editing.

*2: If any error occurs in setting value of time average, the default value 16 will be saved.

Time average is processed after converted to average of the times inside the Analog input module. In this case, a remainder may be produced when setting time is divided by (number of channels used X conversion speed), which will be disregarded. Thus, the average processing frequency will be the quotient of [(setting time) ÷ (number of channels used x conversion speed)].

Ex.) If the number of channels used is 5, and setting time is 151 ms.

151 ms ÷ (5 X 0.5 ms) = 60 times …… Remainder of 4 → 60 times

(b) Count average process

1) Setting range: 2 ~ 64000 (times)

2) The time required for average value to be saved on memory when frequency average used depends on the number of channels used.

Process time = setting frequency X number of channels used X conversion speed

*1: If setting value of count average is not specified within 2 ~ 64000, RUN LED blinks at an interval of 1 second. In order to set RUN LED to On status, reset the setting value of frequency average within 2 ~ 64000 and then convert PLC CPU from STOP to RUN. Be sure to use request flag of error clear (UXY.19.0) to clear the error through modification during RUN..

*2: If any error occurs in setting value of frequency average, the default value 2 will be saved.

Ex.) If the number of channels used is 4, and average processing frequency is 50.

50 X 4 X (0.5 ms) = 25 ms

(c) Weighted average process

Weighted average process function is used to obtain stable digital output value by filtering (delaying) noise or sudden change of input value. Weighted average constant can be specified for respective channels through user program or I/O parameters setting.

1) Setting range: 1 ~ 99(%)

$$F[n] = (1 - \alpha) \times A[n] + \alpha \times F[n - 1]$$

F[n]: Present weighted-average output value
A[n]: Present A/D converted value
F[n-1]: Previous weighted-average output value
α: weighted-average constant (0.01 ~ 0.99: Previous value's weighted value)

a) If weighted value setting value is not specified within 1 ~ 99, RUN LED blinks at an interval of 1 second. In order to set RUN LED to On status, reset the weighted value setting value within 1 ~ 99 and then convert PLC CPU from STOP to RUN. Be sure to use request flag of error clear (UXY.19.0) to clear the error through online editing.

b) If any error occurs in weighted average setting value, the default of average weighted setting value 1 will be saved.

2) In the case of voltage input

a) Analog input range: DC -10 ~ 10 V, Digital output range: 0 ~ 16000.

b) If analog input value changes –10 V → 10 V (0 → 16000), weighted average output value based on αvalue is as specified below.

αvalue	Weighted average output value				Remarks
	-	1 scan	2 scan	3 scan	
*1) 0.01	0	15840	15998	15999	1% inclined toward previous value
*2) 0.5	0	8000	12000	14000	50% inclined toward previous value
*3) 0.99	0	160	318	475	99% inclined toward previous value

*1) 16000 output after about 4 scans

*2) 16000 output after about 24 scans

*3) 16000 output after about 1491 scans (372.75 ms for 1 channel Run)

3) In the case of current input

a) Analog input current range: DC 0 ~ 20 ㎃, Digital output range: 0 ~ 16000.

b) If analog input value changes 0 ㎃ → 10 ㎃ (0 → 8000), weighted average output value based on αvalue is as specified below.

αvalue	Filter output value				Remarks
	-	1 scan	2 scan	3 scan	
*1) 0.01	0	7920	7999	7999	1% inclined toward previous value
*2) 0.5	0	4000	6000	7000	50% inclined toward previous value
*3) 0.99	0	80	159	237	99% inclined toward previous value

*1) 8000 output after about 4 scans

*2) 8000 output after about 21 scans

*3) 8000 output after about 1422 scans (355.5 ms for 1 channel Run)

4) If weighted average process function is not used, present A/D converted value will be output as it is. The weighted average process function takes weighted data between 'Present A/D converted value' and 'Previous A/D converted value'. And the weighted data can be decided with [average value]. If output data shakes too much, set a big [average value].

2.5.3 Input disconnection detection function

(1) Input range available

If the input sign range of 1 ~ 5 V (4 ~ 20 ㎃) is used, the function to detect input circuit disconnected will be available. Detection conditions for respective input sign ranges are as described below in the table.

Input signal range	Voltage/Current value regarded as disconnected
1 ~ 5 V	0.2 V or less
4 ~ 20 mA	0.8 mA or less

(2) Disconnection display for respective channels

Detection sign of disconnection for respective input channels will be saved on UXY. 18.

(X stands for Base No., and Y for Slot No.)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Assigned	CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

BIT	Description
0	Normal
1	Disconnected

(3) Operation

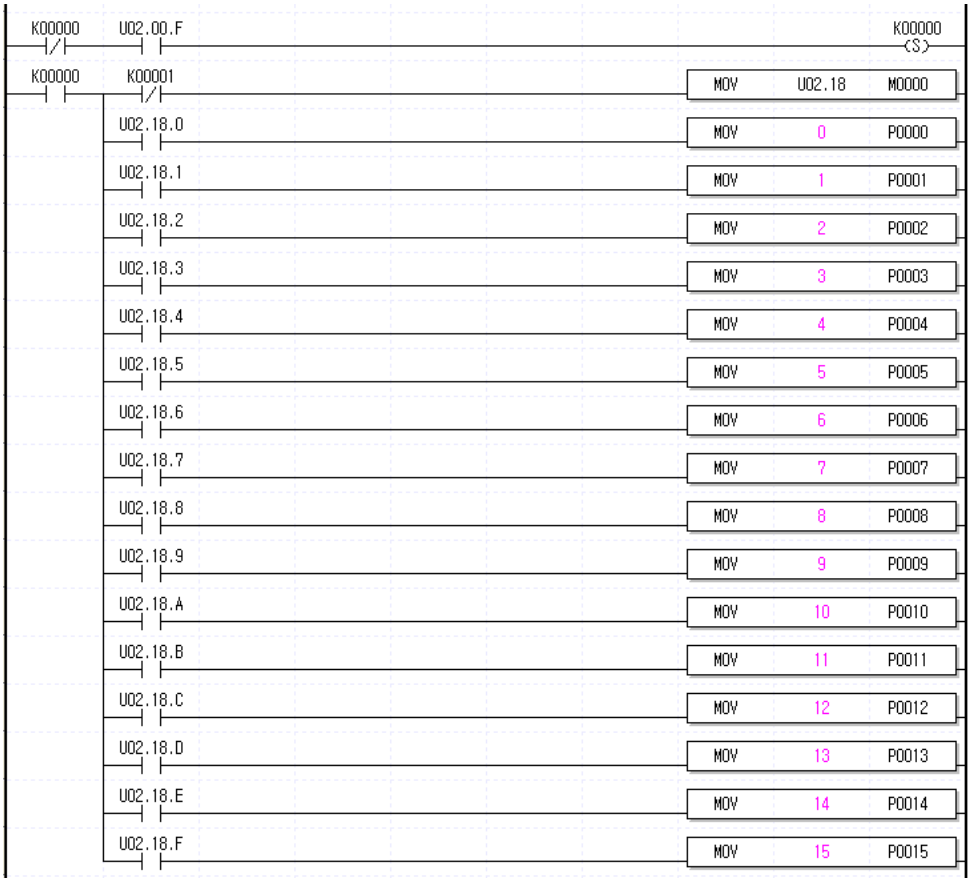
Each bit will be set to 1 if an assigned channel is detected as disconnected, and back to 0 if connected back. In addition, each bit can be used to detect the disconnection in the user program together with execution conditions.

(4) Program Example

If a module is installed on Base No.0 and Slot No.2 with detection flag of disconnection used, it will be as shown below. If the applicable channel is detected as disconnected, the channel number detected will be written on the P area.

(System configuration)

XGP-ACF2	XGK-CPUH	Blank	Blank	XGF-AD16A	Blank



2.5.4 Hold last value (Dedicated for current input)

When input signal exceeds the effective range, last input value is held. This function can be set for each channel by I/O parameter setting or user program.

(1) Input range to be used

This function can be used when you use input signal range of 4~20mA, 0~20mA. So this function can be used in current input module. In this function - enabled channel, only value of effective range is indicated. For example, in case output data type is unsigned value, if this function is disabled, output data has the -192~16191 range. But this function is enabled, output data has the 0~16000 range.

Input current range	Classification	Unsigned	Signed	Precise	Percentile
4 ~ 20 mA	Disable	-192~16191	-8192~8191	3808~20191	-120~10119
	Enable	0~16000	-8000~8000	4000~20000	0~10000
0 ~ 20 mA	Disable	-192~16191	-8192~8191	-240~20239	-120~10119
	Enable	0~16000	-8000~8000	0~20000	0~10000

(2) Operation

When this function is enabled and range is 4~20mA, output value corresponding to sample input value is as follows. (Output data type: 0~16000)

Input current (mA)	12	3	4	12	21	20
Output value	8000	8000	0	12000	12000	16000
Ref.	-	Hold last value	-	-	Hold last value	-

2.5.5 Alarm function

When input signal exceeds effective range, relevant flag turns on.

(1) Input detection condition

Detection condition for each input signal range is as follows.

.

Input signal range	Difference	Tolerance	Lower limit	Upper limit
4~20 mA	16 mA	1.2%	3.808 mA	20.192 mA
0~20 mA	20 mA		-0.24 mA	20.24 mA
1~5 V	4 V		0.952 V	5.048 V
0~5 V	5 V		-0.06 V	5.06 V
0~10 V	10 V		-0.12 V	10.12 V
-10~10 V	20 V		-10.24 V	10.24 V

(2) Alarm indication for each channel

Alarm detection signal is saved at UXY.20 and UXY.21. If input signal returns to the within of effective range, alarm detection signal also returns to the normal status automatically.

(X: base number, Y: slot number)

UXY.20: upper limit

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Allocation	-	-	-	-	-	-	-	-	CH 7	CH 6	CH 5	CH 4	CH 3	CH 2	CH 1	CH 0

BIT	Description
0	Normal
1	Upper limit alarm

UXY.21: lower limit

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Initial value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Allocation	-	-	-	-	-	-	-	-	CH 7	CH 6	CH 5	CH 4	CH 3	CH 2	CH 1	CH 0

BIT	Description
0	Normal
1	Lower limit alarm

Chapter 3 Installation and Wiring

3.1 Installation

3.1.1 Installation environment

This product is of high reliance regardless of installation environment. However, for the sake of reliance and stability of the system, please pay attention to those precautions described below.

1) Environmental conditions
   - To be installed on the control panel waterproof and dustproof.
   - No continuous impact or vibration shall be expected.
   - Not to be exposed to the direct sunlight.
   - No dew shall be caused by rapid temperature change.
   - Ambient temperature shall be kept 0-55℃.

2) Installation work
   - No wiring waste is allowed inside PLC when wiring or drilling screw holes.
   - To be installed on a good location to work on.
   - Don't let it installed on the same panel as a high-voltage device is on.
   - Let it kept at least 50㎜ away from duct or near-by module.
   - To be grounded in an agreeable place free from noise.

3.1.2 Precautions for handling

Precautions for handling Analog input module are as described below from the opening to the installation.

1) Don't let it dropped or shocked hard.
2) Don't remove PCB from the case. It will cause abnormal operation
3) Don't let any foreign materials including wiring waste inside the top of the module when wiring. Remove foreign materials if any inside.
4) Don't install or remove the module while powered on.

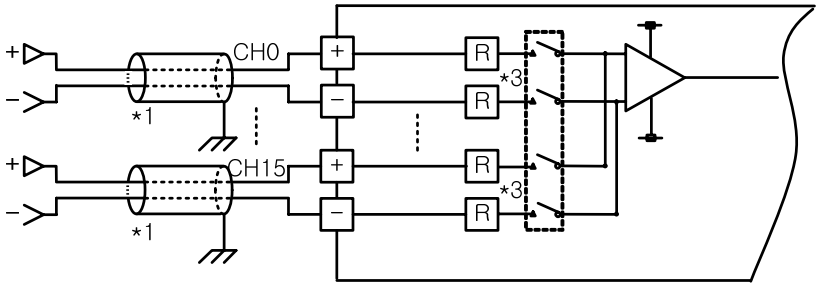
3.2 Wiring

3.2.1 Precautions for wiring

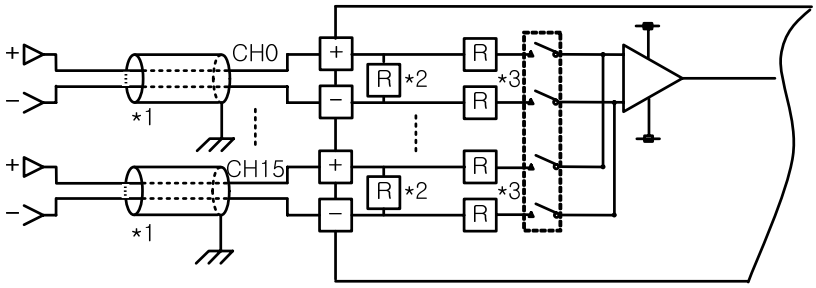
1) Don't let AC power line near to Analog input module's external input sign line. With an enough distance kept away between, it will be free from surge or inductive noise.
2) Cable shall be selected in due consideration of ambient temperature and allowable current, whose size is not less than the max. cable standard of AWG22 (0.3㎟).
3) Don't let the cable too close to hot device and material or in direct contact with oil for long, which will cause damage or abnormal operation due to short-circuit.
4) Check the polarity when wiring the terminal.
5) Wiring with high-voltage line or power line may produce inductive hindrance causing abnormal operation or defect.

3.2.2 Wiring examples

1) Voltage input

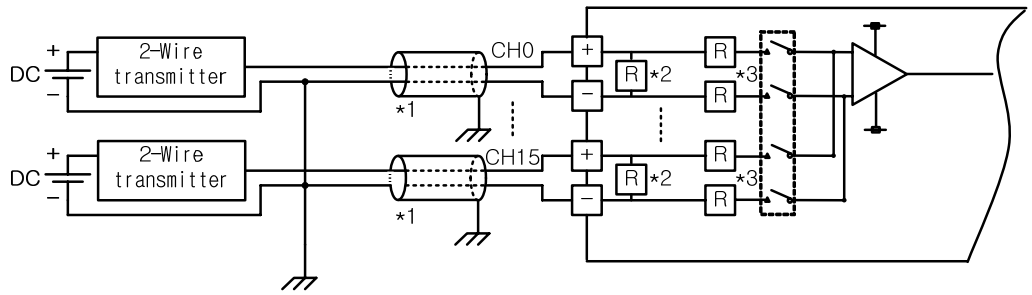


2) Current input



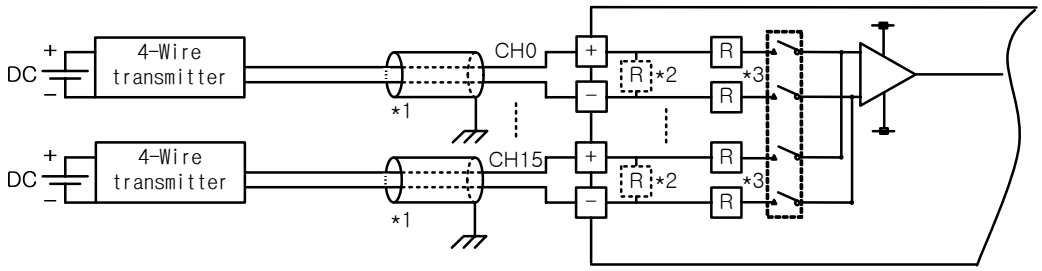
*1) Use a 2-core twisted shielded wire. AWG 22 is recommended for the cable standard.
*2) XGF-AD16A's current input resistance is 250 Ω (typ.).
*3) XGF-AD16A's voltage input resistance is 1 MΩ (min.).

3) Wiring example of 2-wire sensor/transmitter (current input)



-. Run the channel to be used only.
-. Analog input module does not provide power for the input device. Use an external power supplier.

4) Wiring example of 4- wire sensor/transmitter (voltage/current input)

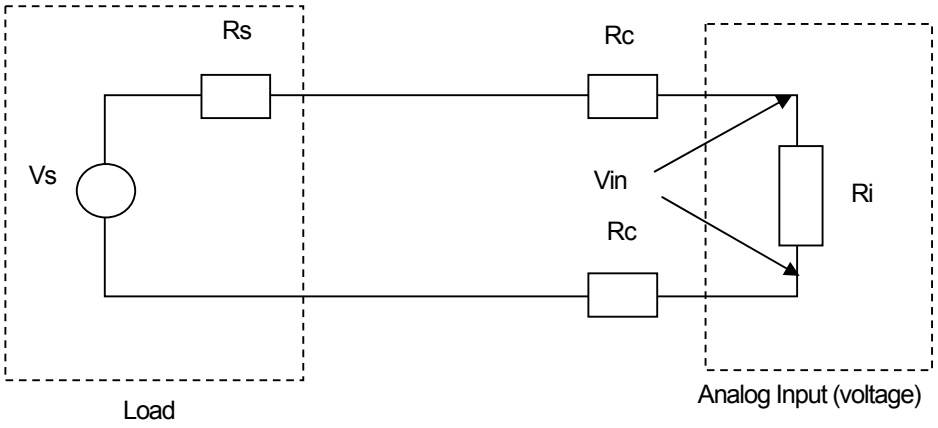


-. Start the channel to be used only.
-. Analog input module does not provide power for the input device. Use an external power supplier.

* 1) Use a 2-core twisted shielded wire. AWG 22 is recommended for the cable standard.
* 2) XGF-AD16A's current input resistance is 250 Ω (typ.).
* 3) XGF-AD16A's voltage input resistance is 1 MΩ (min.).

5) Relationship between voltage input accuracy and wiring length

In voltage input, the wiring (cable) length between transmitter or sensor and module has an effect on digital-converted values of the module as specified below;



Where,

Rc: Resistance value due to line resistance of cable

Rs: Internal resistance value of transmitter or sensor

Ri: Internal resistance value (1㏁) of voltage input module

Vin: Voltage allowed to analog input module

% Vi: Tolerance of converted value (%) due to source and cable length in voltage input

$$Vin = \frac{Ri \times Vs}{[Rs + (2 \times Rc) + Ri]}$$

$$\%Vi = \left(1 - \frac{Vin}{Vs}\right) \times 100\,\%$$

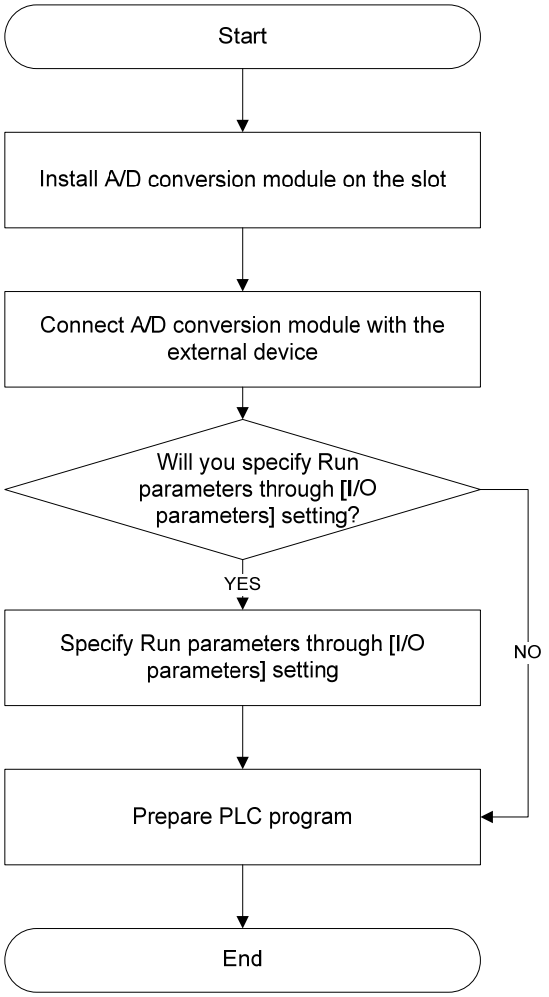
Notes

In current input, there will be no accuracy tolerance caused by cable length and internal resistance of the Source.

Chapter 4 Operation Setting

4.1 Operation Procedures

The processing for the operation is as shown in Fig. 4.1.



[Fig. 4. 1] Procedures for the operation

4.2 Operation Parameters Setting

Analog input module's operation parameters can be specified through XG5000's [I/O parameters].

4.2.1 Settings

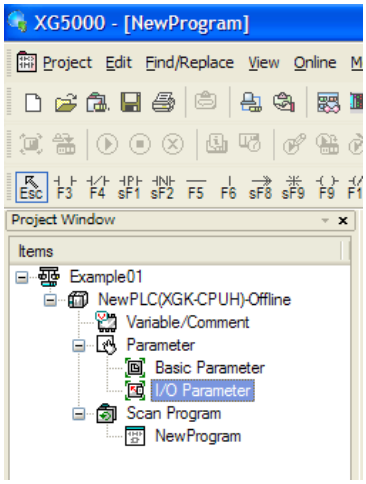
For the user's convenience of Analog input module, XG5000 provides GUI (Graphical User Interface) for parameters setting of Analog input module. Setting items available through [I/O parameters] on the XG5000 project window are as described below in the table 4.1.

[Table 4. 1] Function of [I/O Parameters]

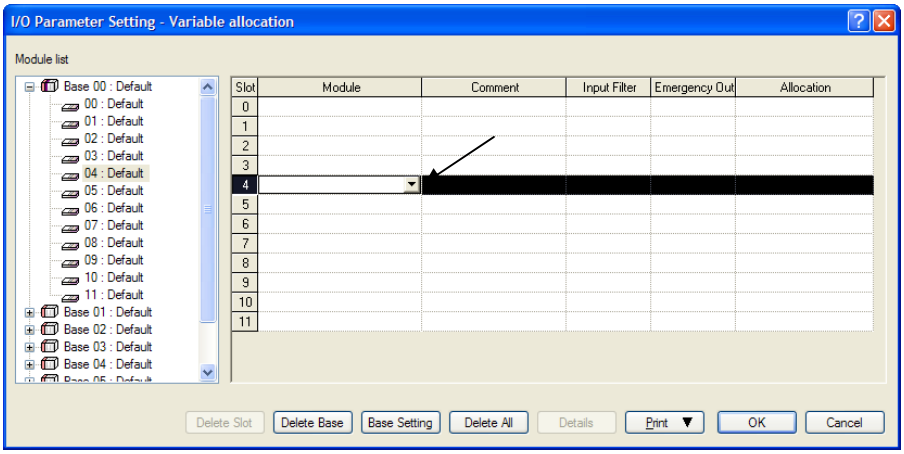
Item	Details
[I/O parameters]	(1) Specify the following setting items necessary for the module operation. (a) Channel Enable/Disable setting (b) Setting analog input range (c) Digital output data format setting (d) Average process method setting (e) Average value setting (2) The data specified by user through S/W package will be saved on Analog input module when [I/O Parameters] are downloaded. In other words, the point of time when [I/O Parameters] are saved on Analog input module has nothing to do with PLC CPU's status RUN or SPOP.

4.2.2 How to use [I/O Parameters]

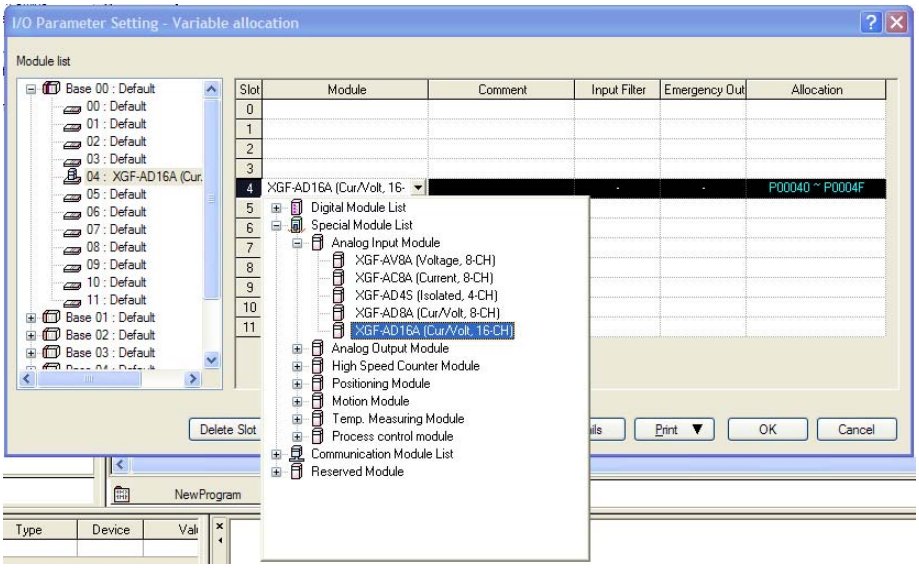
(1) Run XG5000 to create a project. (Refer to XG5000 program manual for details on how to create the project)
(2) Double-click [I/O parameters] on the project window.



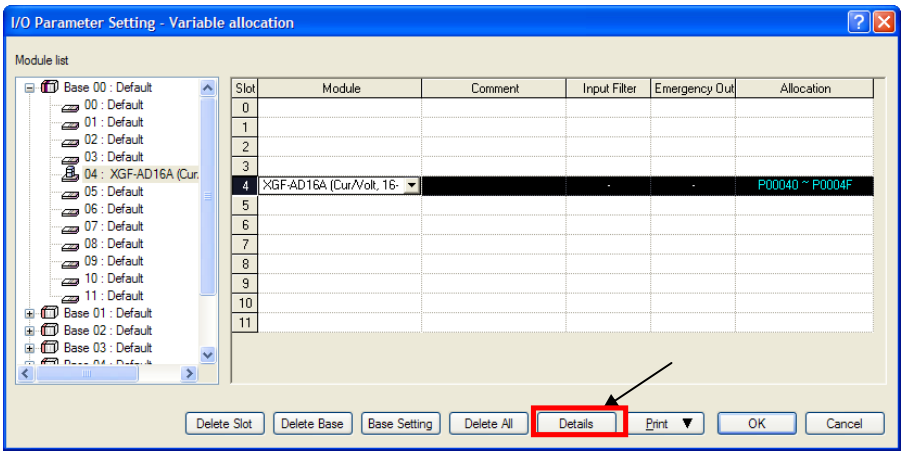
(3) On the 'I/O parameters setting' screen, find and click the slot of the base Analog input module is installed on. 16-channel voltage type of Analog input module is installed on Base No.0, Slot No.4 in this description.



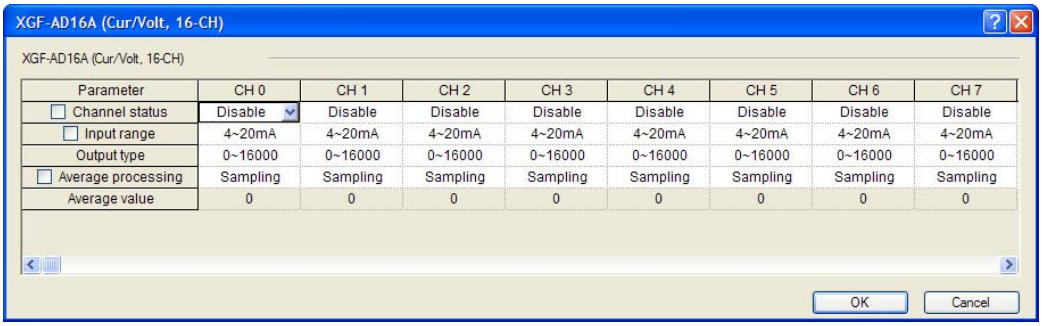
(4) Click the arrow button on the screen above to display the screen where an applicable module can be selected. Search for the applicable module to select.

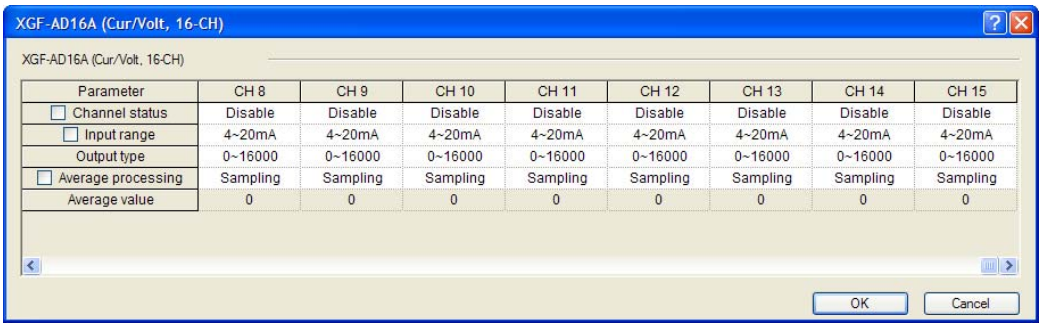


(5) After the module selected, click [Details]

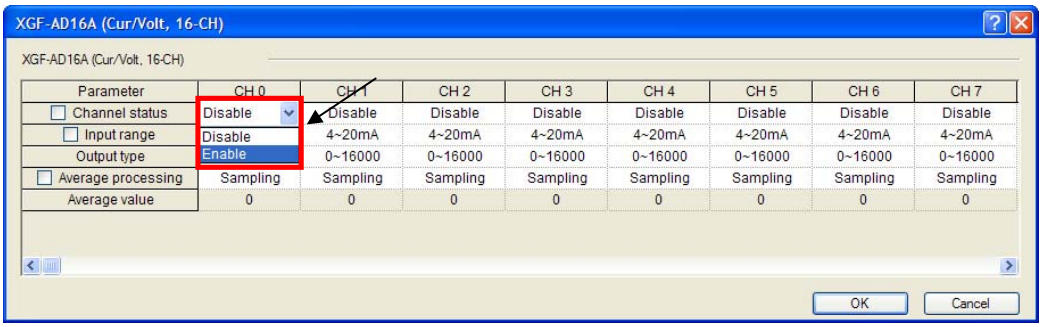


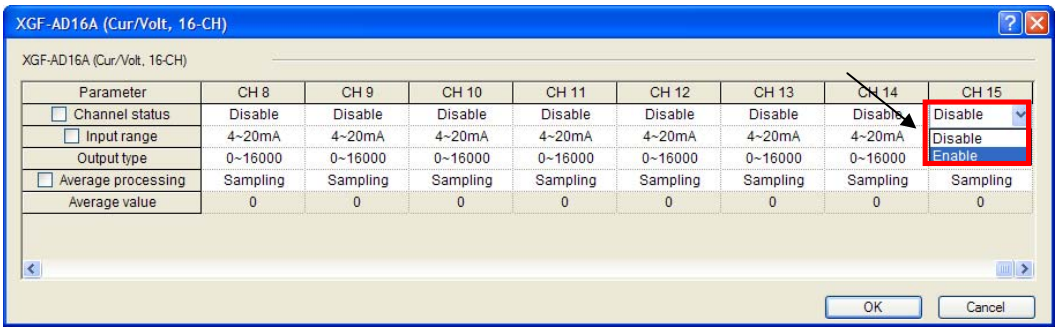
(6) A screen will be displayed for you to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items.



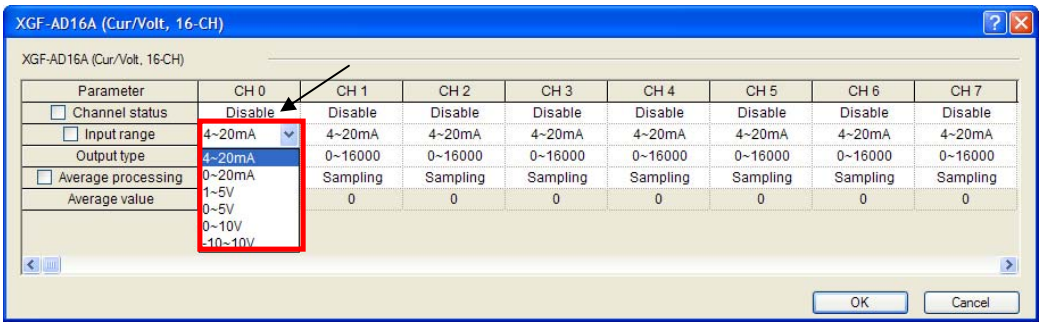


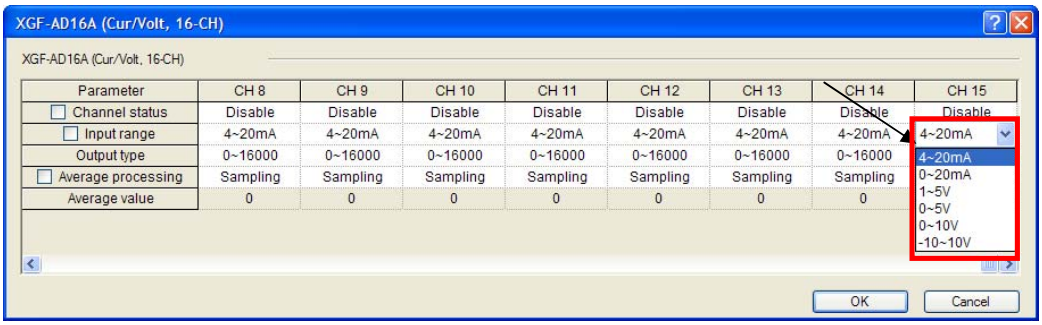
(a) Channel status: Select Disable or Enable



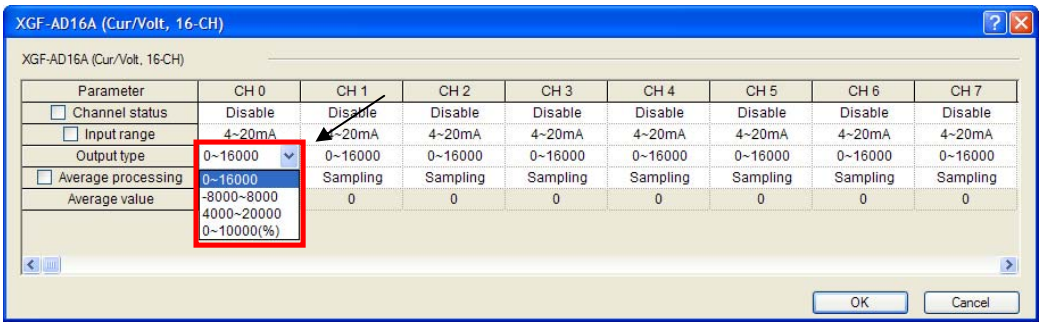


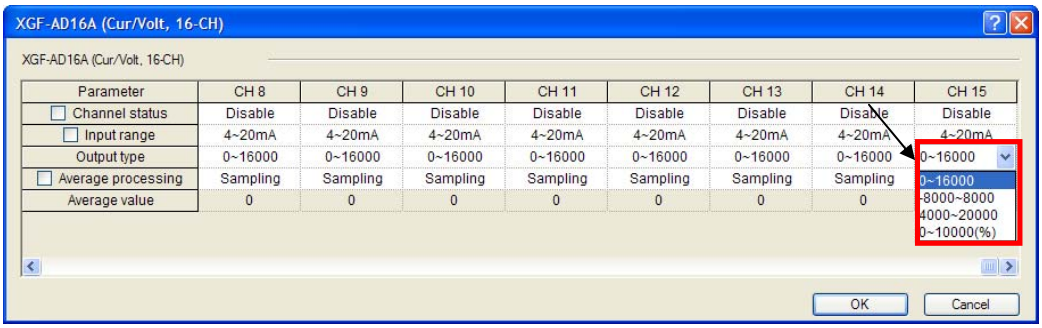
(b) Input range: Select the range of analog input voltage or current as desired. Analog input module provides 4 voltage input ranges and 2 current input ranges.



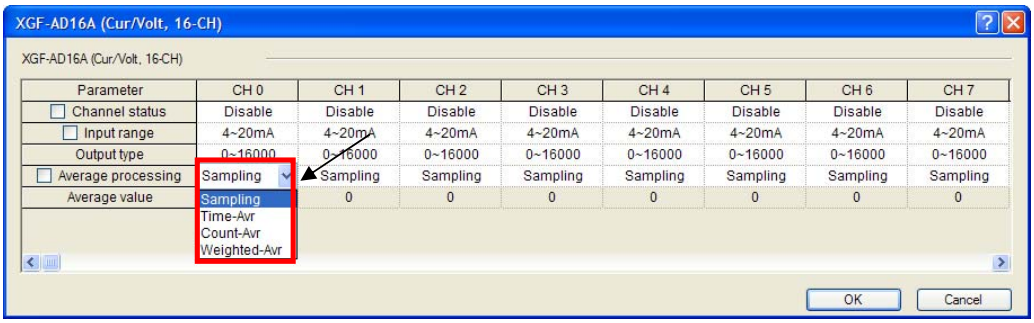


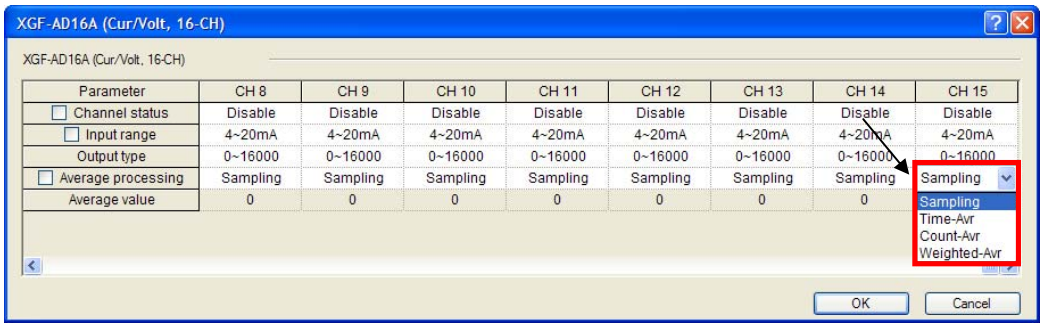
(c) Output type: Select the type of output data. 4 formats are available in total.



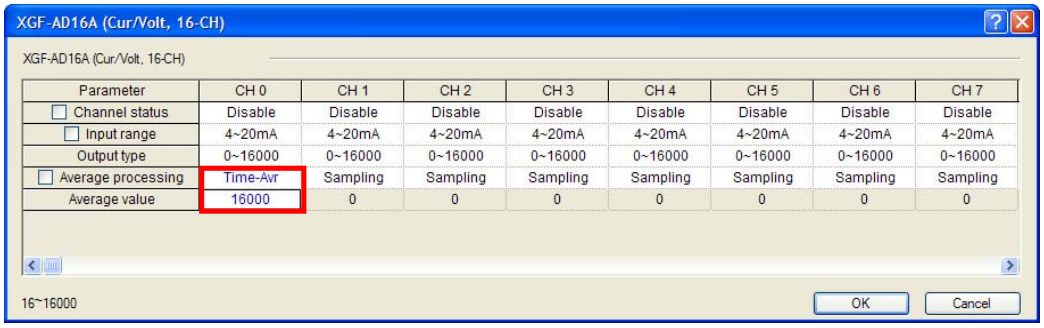


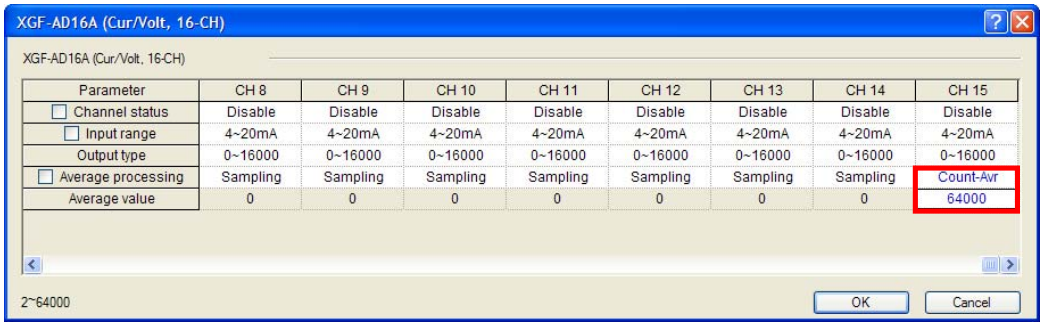
(d) Average processing: Set the average processing type. 4 methods are available.





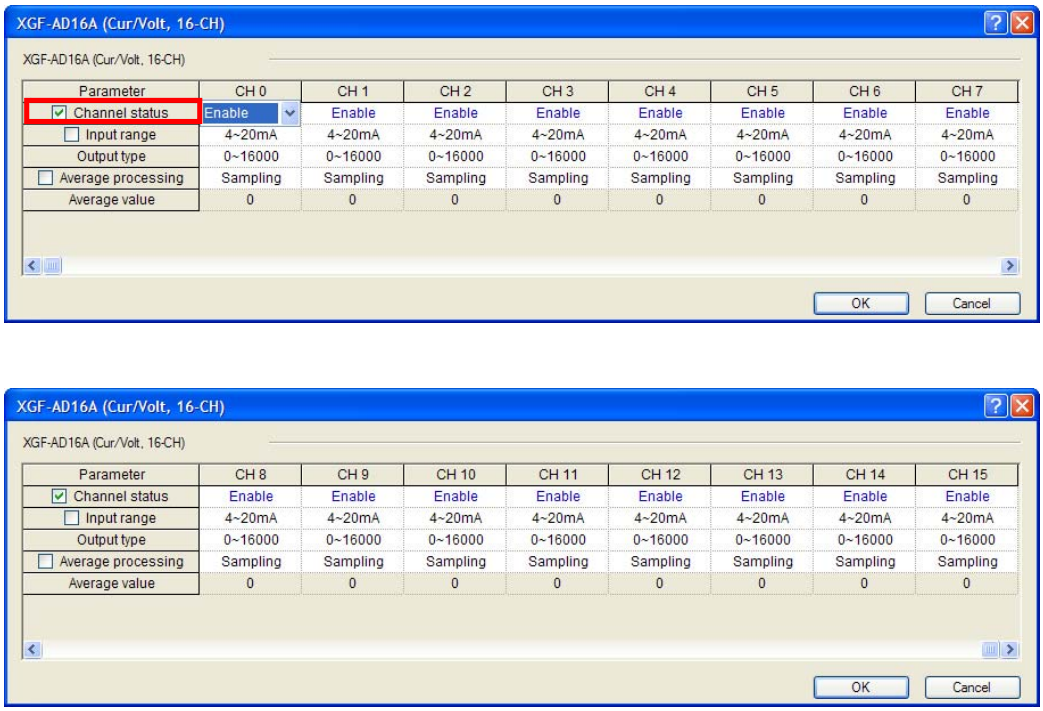
(e) Average value: This field is activated when Average processing field is set as Time-Avr, Count-Avr, Weighted-Avr except Sampling. If you double-click Average value field, you can input value. 16~16000 range for Time-Avr, 2~64000 range for Count-Avr and 0~99 range for Weighted-Avr. If the value exceeds that range, input is not available.





(f) How to select the whole channels to change parameters: Click and check the radio button in the parameters item in order to change the whole channels to identical setting value. And then change the parameters of an optional channel to change the parameters of the whole channels at a time. Fig. 4.2 shows an example that Channel Status is changed to whole channels 'Enable' by means of this function.

[Fig. 4. 2] Parameters change of the whole channels



4.3 Special Module Monitoring Functions

Functions of Special Module Monitoring are as described below in table 4.3.

[Table 4.3] Functions of Special Module Monitoring

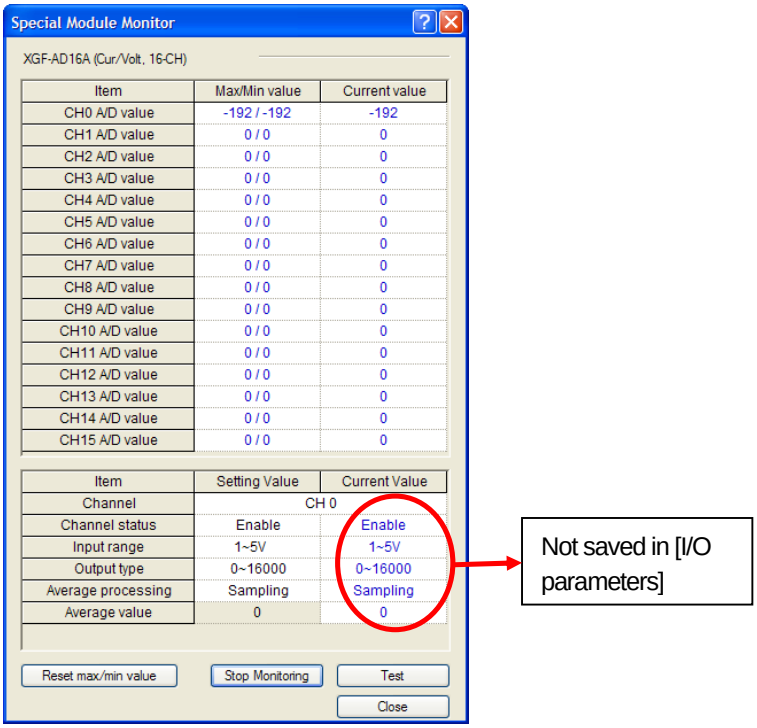
Item	Details	Remark
[Special Module Monitoring]	(1) Monitor/Test Through applicable XG5000 menu of [Monitor] -> [Special Module Monitoring], A/D converted value can be monitored and the operation of Analog input module can be tested. (2) Monitoring the max./min. value The max./min. value of the channel can be monitored during Run. However, the max./min. value displayed here is based on the present value shown on the screen. Accordingly, when [Monitoring/Test] screen is closed, the max./min. value will not be saved.	–

Notes

The screen may not be normally displayed due to insufficient system resource. In such a case, close the screen and finish other applications in order to restart XG5000.

4.4 Precautions

(1) The parameters specified for the test of Analog input module on the “Monitor Special Module” screen of [Monitor Special Module] will be deleted the moment the “Monitor Special Module” screen is closed. In other words, the parameters of Analog input module specified on the “Monitor Special Module” screen will not be saved in [I/O parameters] located on the left tab of XG5000.

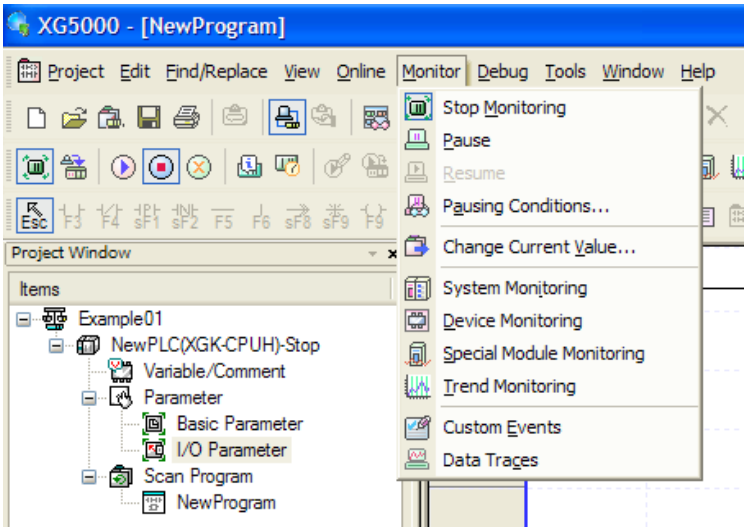


(2) Test function of [Monitor Special Module] is provided for user to check the normal operation of Analog input module even without sequence programming. If Analog input module is to be used for other purposes than a test, use parameters setting function in [I/O parameters].

4.5 Special Module Monitoring

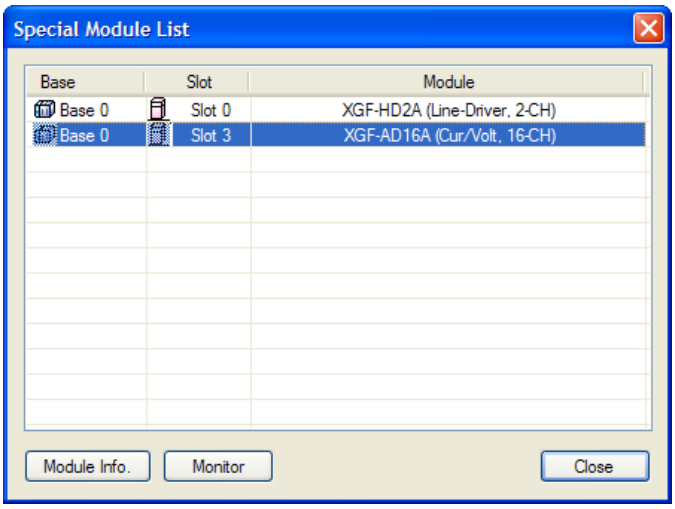
4.5.1 Start of [Special Module Monitoring]

Go through [Online] -> [Connect] and [Monitor] -> [Special Module Monitoring] to start. If the status is not [Online], [Special Module Monitoring] menu will not be active.



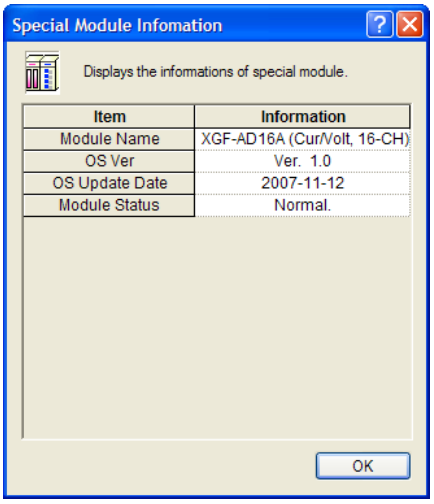
4.5.2 How to use [Special Module Monitoring]

(1) With XG5000 connected to PLC CPU (on-line status), click [Monitor] -> [Special Module Monitoring] to display 'Special Module List' screen as in Fig. 5.1 showing base/slot information in addition to special module type. The module installed on the present PLC system will be displayed on the list dialog box.



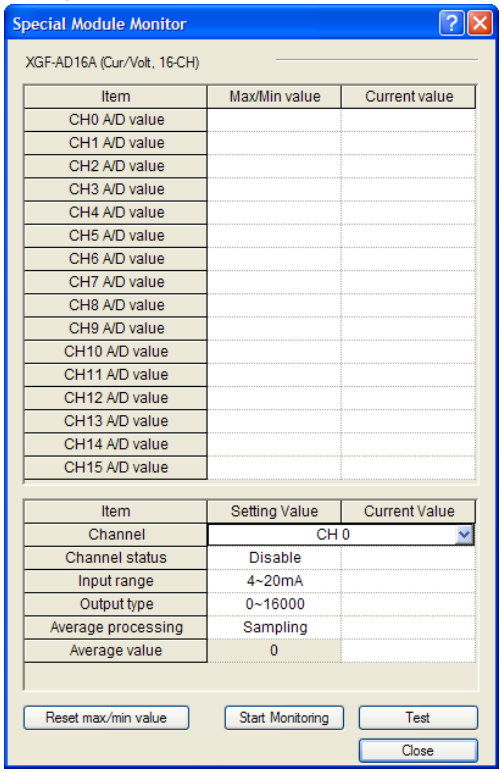
[Fig. 5. 1] Screen of [Special Module List]

(2) Select Special Module in Fig. 5.1 and click [Module Information] to display the information as in Fig. 5.2.



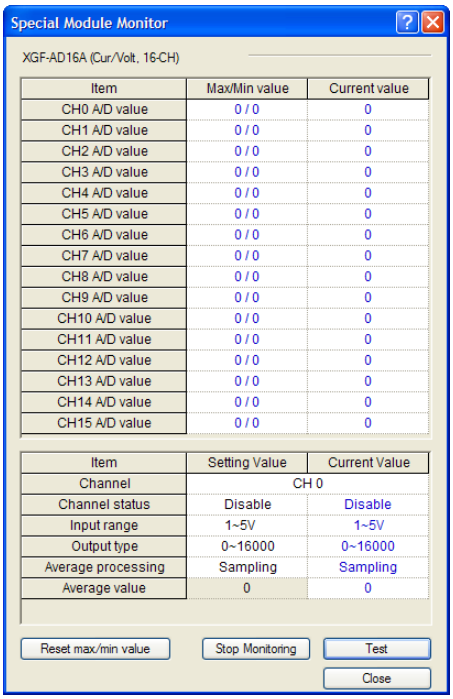
[Fig. 5. 2] Screen of [Special Module Information]

(3) Click [Monitor] on the "Special Module" screen in Fig. 5.1 to display [Special Module Monitoring] screen as in Fig. 5.3, where 4 options are available such as [Reset max./min. value], [Start Monitoring], [Test] and [Close]. Analog input module's output value and max./ min. value are displayed on the monitoring screen at the top of the screen, and parameters items of respective modules are displayed for individual setting on the test screen at the bottom of the screen.



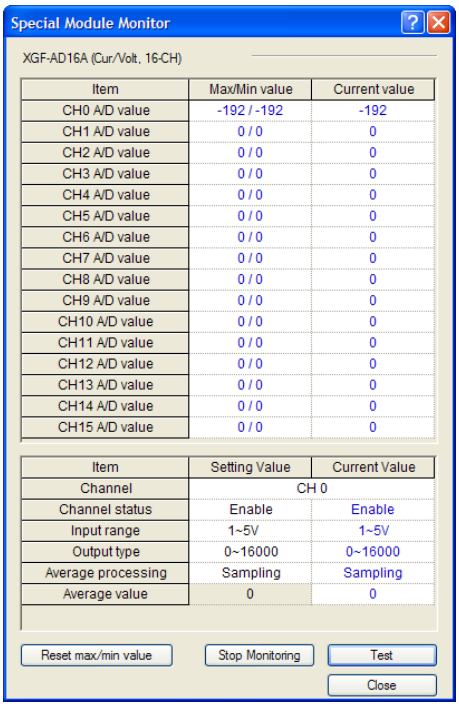
[Fig. 5. 3] [Special Module Monitoring] screen

(a) [Start Monitoring]: Click [Start Moitoring] to display A/D converted value of the presently operated channel. Fig. 5.4 is the monitoring screen displayed when the whole channels of analog input module are in Stop status. In the present value field at the screen bottom, presently specified parameters of Analog input module are displayed.



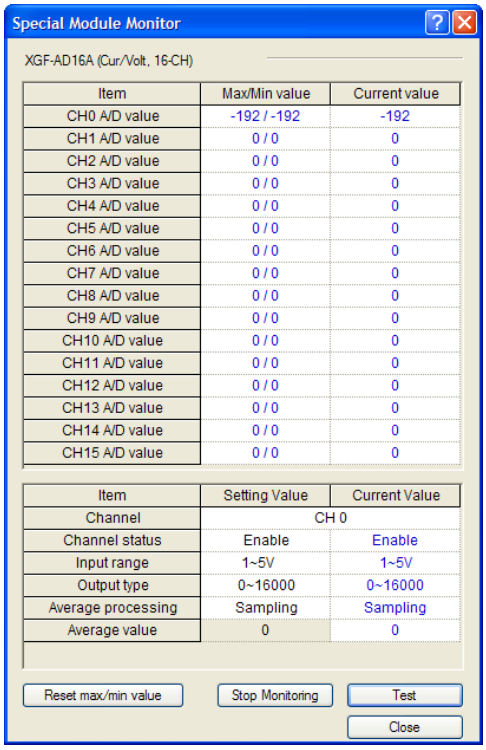
[Fig. 5. 4] Execution screen of [Start Monitoring]

(b) [Test]: [Test] is used to change the presently specified parameters of Analog input module. Click the setting value at the bottom field of the screen to change parameters. Fig. 5.5 will be displayed after [Test] is executed with channel 0's input voltage range changed to 1 ~ 5 V in the state of input not wired.



[Fig. 5. 5] Execution screen of [Test]

(c) [Reset Max./Min. value]: The max./min. value field at the upper screen shows the max. value and the min. value of A/D converted value. Click [Reset max./min. value] to initialize the max./min. value. Fig.5.6 is after [Reset max./min. value] button is clicked in the Fig. 5.5, where channel 0's A/D converted value can be checked as reset.



[Fig. 5. 6] Execution screen of [Reset max./min. value]

(d) [Close]: [Close] is used to escape from the monitoring/test screen. When the monitoring/test screen is closed, the max. value, the min. value and the present value will not be saved any more.

4.6 Register U Devices

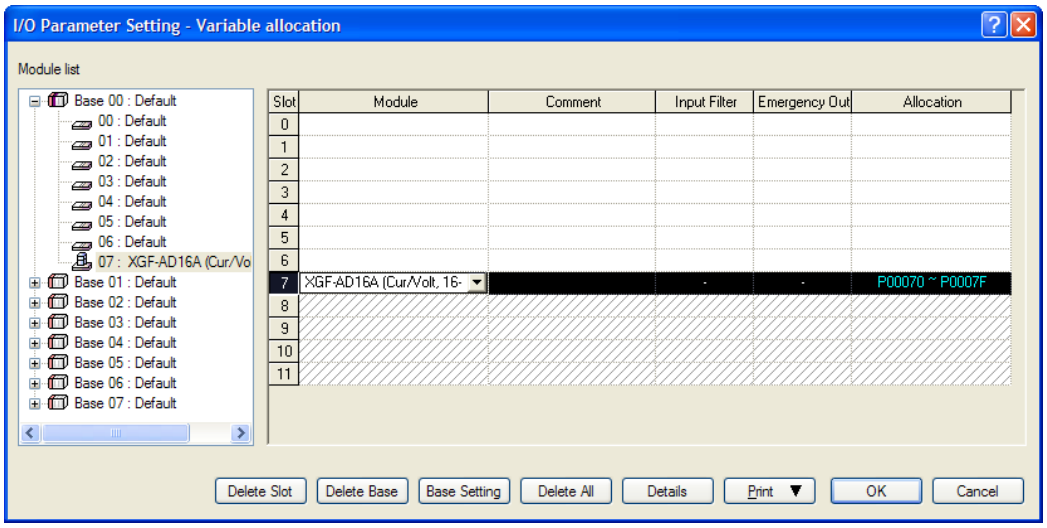
This section describes the automatic registration function of the U device in the XG5000.

4.6.1 Register U devices

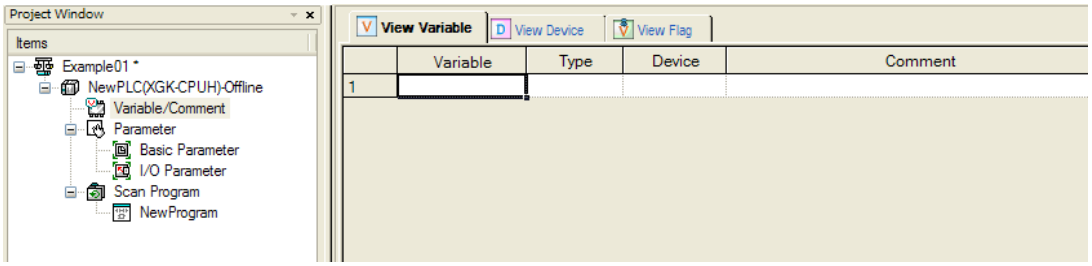
Register the variables for each module referring to the special module information that is set in the I/O parameter. The user can modify the variables and comments.

［Procedure］

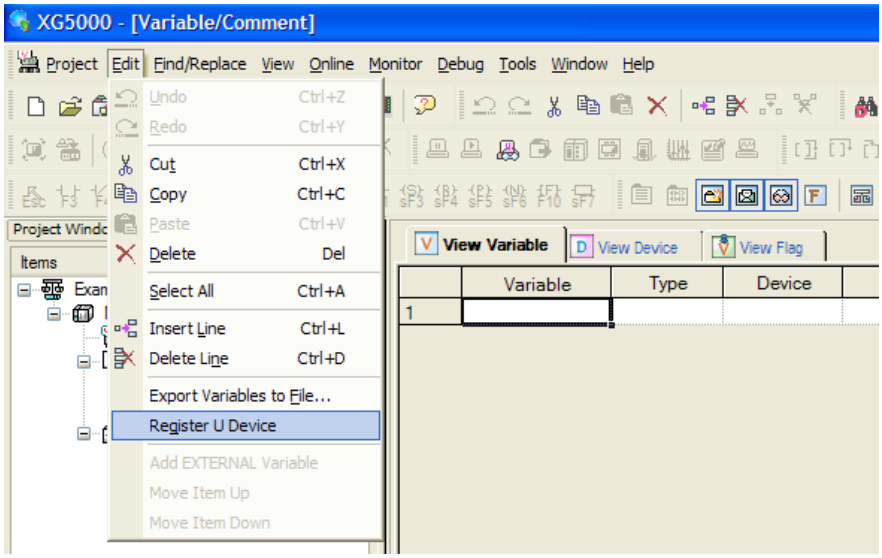
(1) Select the special module type in the [I/O parameter setting] window.



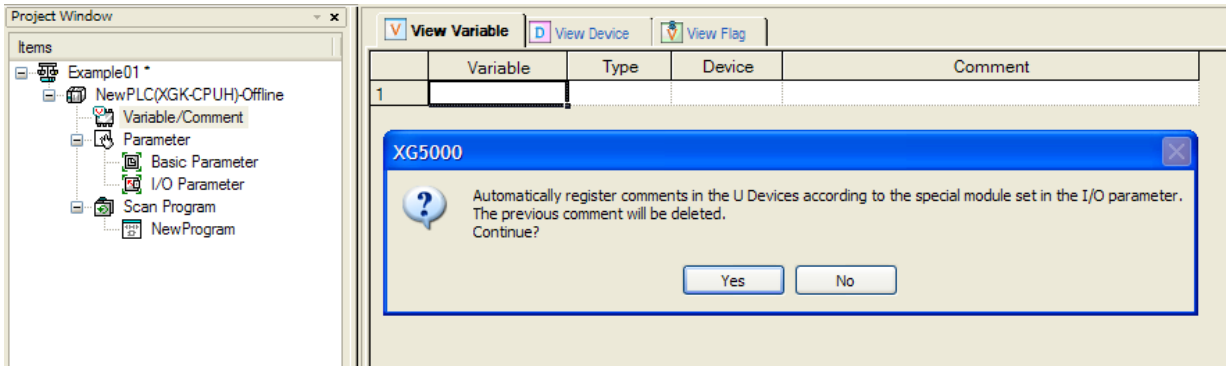
(2) Double click 'Variable/Comment' from the project window



(3) Select [Edit] -> [Register U Device].



(4) Click 'Yes'



(5) As shown below, the variables are registered.

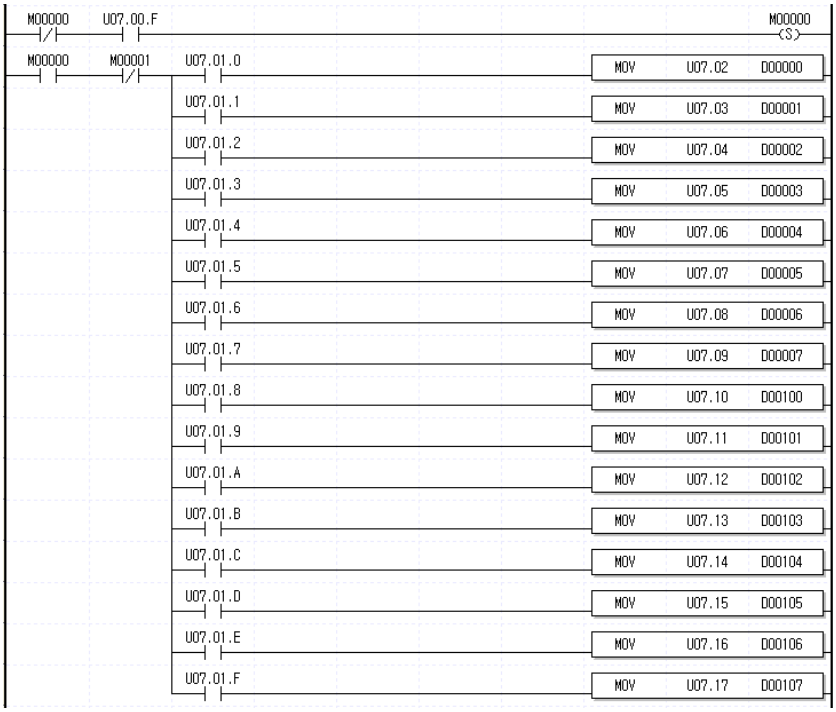
	Variable	Type	Device	Comment
1	_07_ERR	BIT	U07.00.0	Analog Input Module: Module Error
2	_07_RDY	BIT	U07.00.F	Analog Input Module: Module Ready
3	_07_CH0_ACT	BIT	U07.01.0	Analog Input Module: CH0 Active
4	_07_CH1_ACT	BIT	U07.01.1	Analog Input Module: CH1 Active
5	_07_CH2_ACT	BIT	U07.01.2	Analog Input Module: CH2 Active
6	_07_CH3_ACT	BIT	U07.01.3	Analog Input Module: CH3 Active
7	_07_CH4_ACT	BIT	U07.01.4	Analog Input Module: CH4 Active
8	_07_CH5_ACT	BIT	U07.01.5	Analog Input Module: CH5 Active
9	_07_CH6_ACT	BIT	U07.01.6	Analog Input Module: CH6 Active
10	_07_CH7_ACT	BIT	U07.01.7	Analog Input Module: CH7 Active
11	_07_CH8_ACT	BIT	U07.01.8	Analog Input Module: CH8 Active
12	_07_CH9_ACT	BIT	U07.01.9	Analog Input Module: CH9 Active
13	_07_CH10_ACT	BIT	U07.01.A	Analog Input Module: CH10 Active
14	_07_CH11_ACT	BIT	U07.01.B	Analog Input Module: CH11 Active
15	_07_CH12_ACT	BIT	U07.01.C	Analog Input Module: CH12 Active
16	_07_CH13_ACT	BIT	U07.01.D	Analog Input Module: CH13 Active
17	_07_CH14_ACT	BIT	U07.01.E	Analog Input Module: CH14 Active
18	_07_CH15_ACT	BIT	U07.01.F	Analog Input Module: CH15 Active
19	_07_CH0_IDD	BIT	U07.18.0	Analog Input Module: CH0 Input Disconnection Flag
20	_07_CH1_IDD	BIT	U07.18.1	Analog Input Module: CH1 Input Disconnection Flag
21	_07_CH2_IDD	BIT	U07.18.2	Analog Input Module: CH2 Input Disconnection Flag
22	_07_CH3_IDD	BIT	U07.18.3	Analog Input Module: CH3 Input Disconnection Flag
23	_07_CH4_IDD	BIT	U07.18.4	Analog Input Module: CH4 Input Disconnection Flag
24	_07_CH5_IDD	BIT	U07.18.5	Analog Input Module: CH5 Input Disconnection Flag
25	_07_CH6_IDD	BIT	U07.18.6	Analog Input Module: CH6 Input Disconnection Flag
26	_07_CH7_IDD	BIT	U07.18.7	Analog Input Module: CH7 Input Disconnection Flag
27	_07_CH8_IDD	BIT	U07.18.8	Analog Input Module: CH8 Input Disconnection Flag
28	_07_CH9_IDD	BIT	U07.18.9	Analog Input Module: CH9 Input Disconnection Flag
29	_07_CH10_IDD	BIT	U07.18.A	Analog Input Module: CH10 Input Disconnection Flag
30	_07_CH11_IDD	BIT	U07.18.B	Analog Input Module: CH11 Input Disconnection Flag
31	_07_CH12_IDD	BIT	U07.18.C	Analog Input Module: CH12 Input Disconnection Flag
32	_07_CH13_IDD	BIT	U07.18.D	Analog Input Module: CH13 Input Disconnection Flag
33	_07_CH14_IDD	BIT	U07.18.E	Analog Input Module: CH14 Input Disconnection Flag
34	_07_CH15_IDD	BIT	U07.18.F	Analog Input Module: CH15 Input Disconnection Flag
35	_07_ERR_CLR	BIT	U07.19.0	Analog Input Module: Error Clear Request
36	_07_CH0_DATA	WORD	U07.02	Analog Input Module: CH0 Output
37	_07_CH1_DATA	WORD	U07.03	Analog Input Module: CH1 Output
38	_07_CH2_DATA	WORD	U07.04	Analog Input Module: CH2 Output
39	_07_CH3_DATA	WORD	U07.05	Analog Input Module: CH3 Output
40	_07_CH4_DATA	WORD	U07.06	Analog Input Module: CH4 Output
41	_07_CH5_DATA	WORD	U07.07	Analog Input Module: CH5 Output
42	_07_CH6_DATA	WORD	U07.08	Analog Input Module: CH6 Output
43	_07_CH7_DATA	WORD	U07.09	Analog Input Module: CH7 Output
44	_07_CH8_DATA	WORD	U07.10	Analog Input Module: CH8 Output
45	_07_CH9_DATA	WORD	U07.11	Analog Input Module: CH9 Output
46	_07_CH10_DATA	WORD	U07.12	Analog Input Module: CH10 Output
47	_07_CH11_DATA	WORD	U07.13	Analog Input Module: CH11 Output
48	_07_CH12_DATA	WORD	U07.14	Analog Input Module: CH12 Output
49	_07_CH13_DATA	WORD	U07.15	Analog Input Module: CH13 Output
50	_07_CH14_DATA	WORD	U07.16	Analog Input Module: CH14 Output
51	_07_CH15_DATA	WORD	U07.17	Analog Input Module: CH15 Output

4.6.2 Save variables

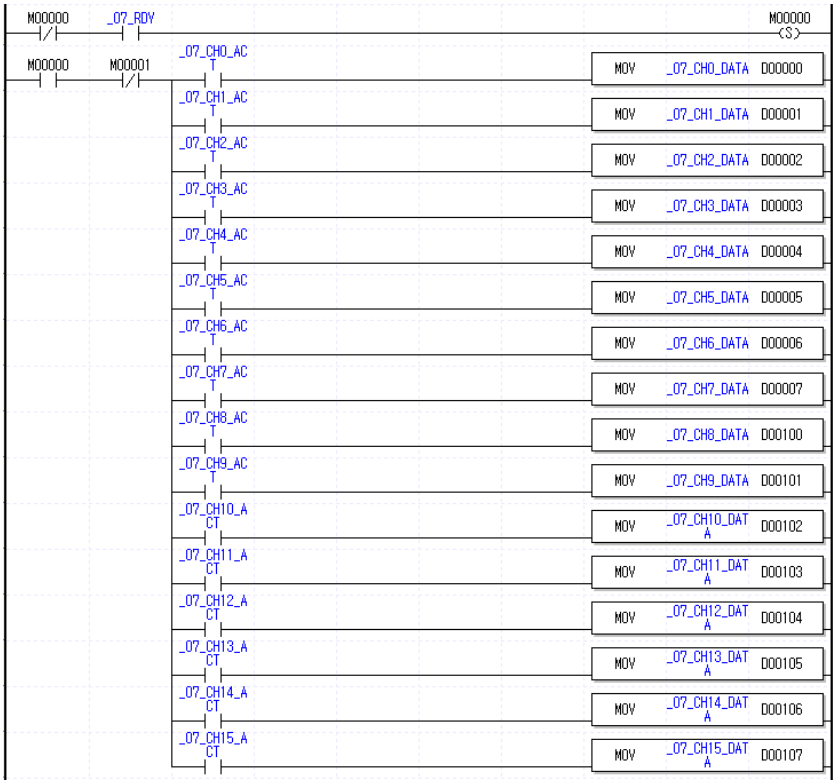
(1) The contents of 'View Variable' can be saved as a text file.
(2) Select [Edit] -> [Export to File].
(3) The contents of 'View variable' are saved as a text file.

4.6.3 View variables

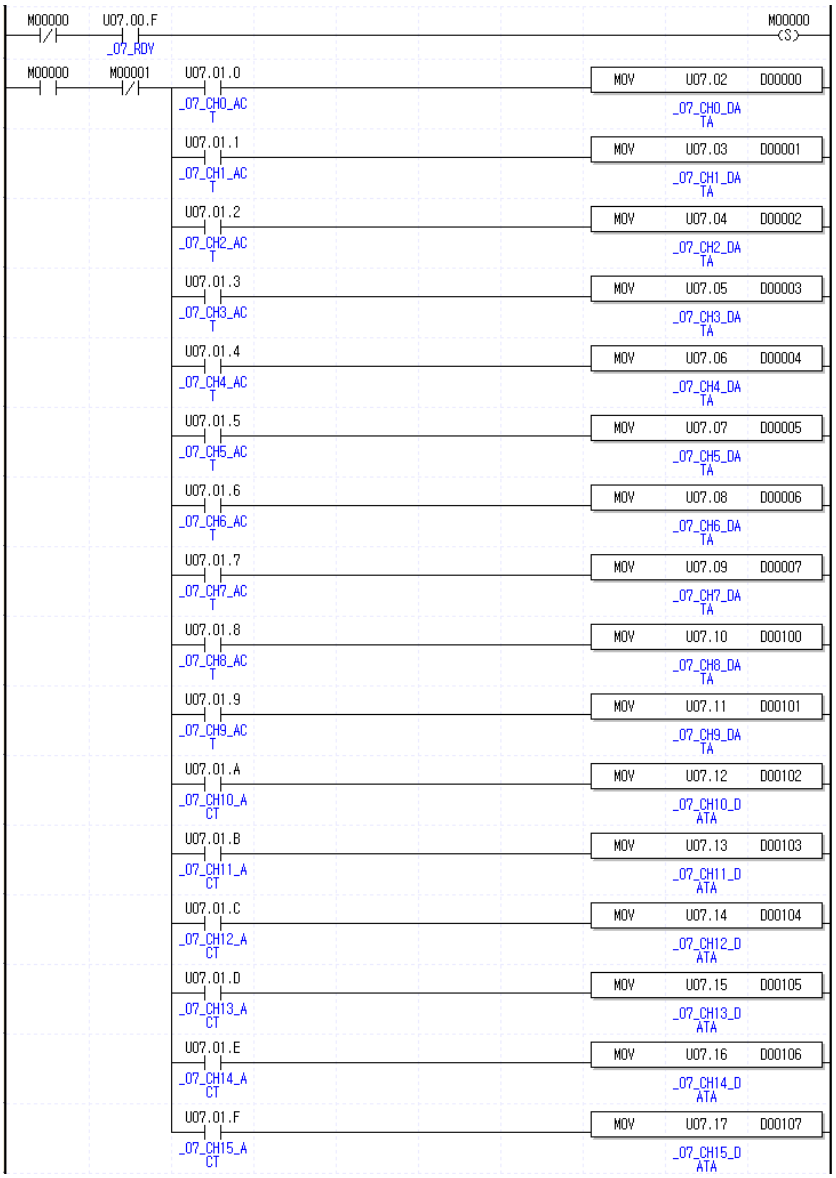
(1) The example program of XG5000 is as shown in below.



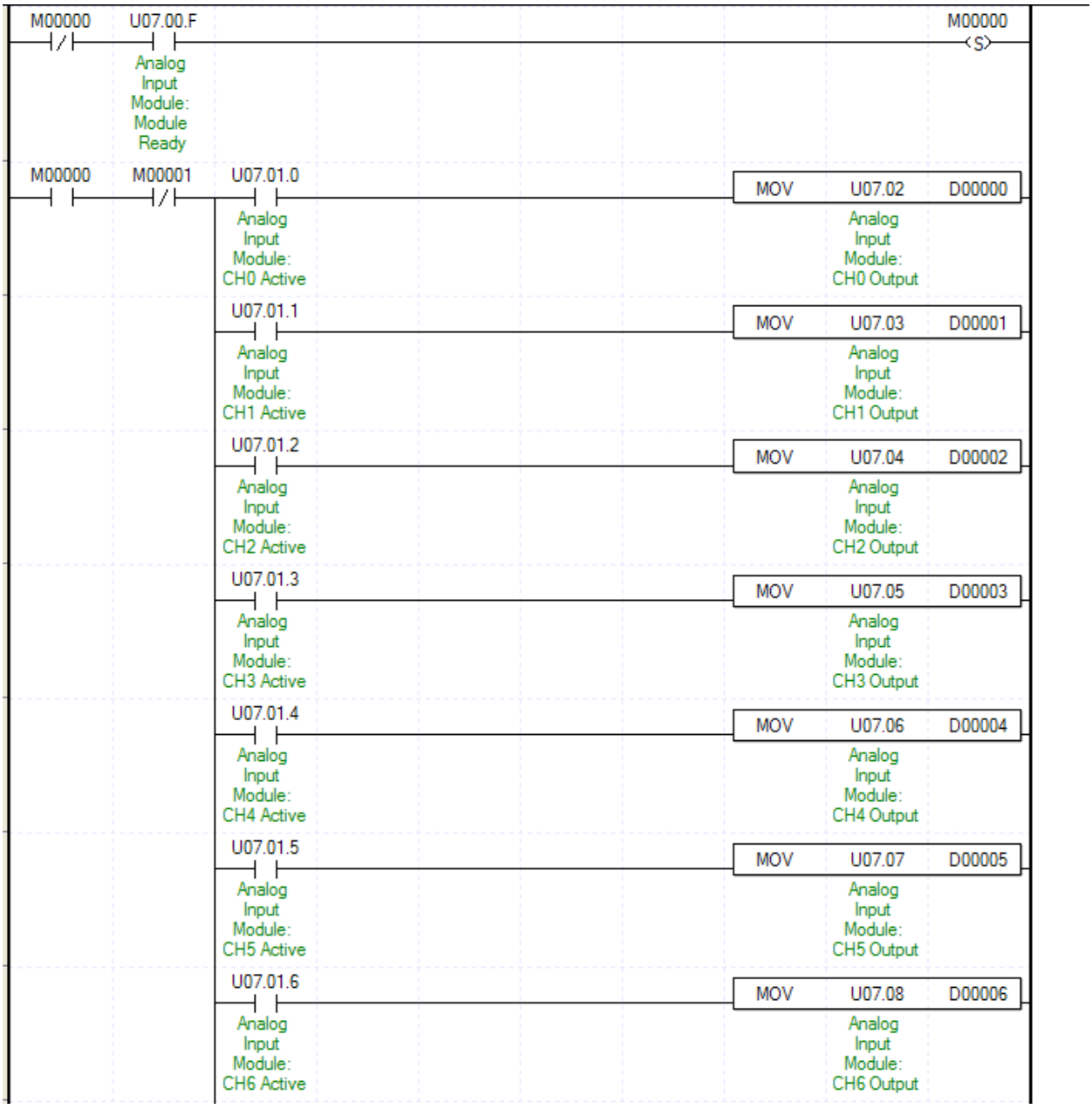
(2) Select [View] -> [Variables]. The devices are changed into variables.

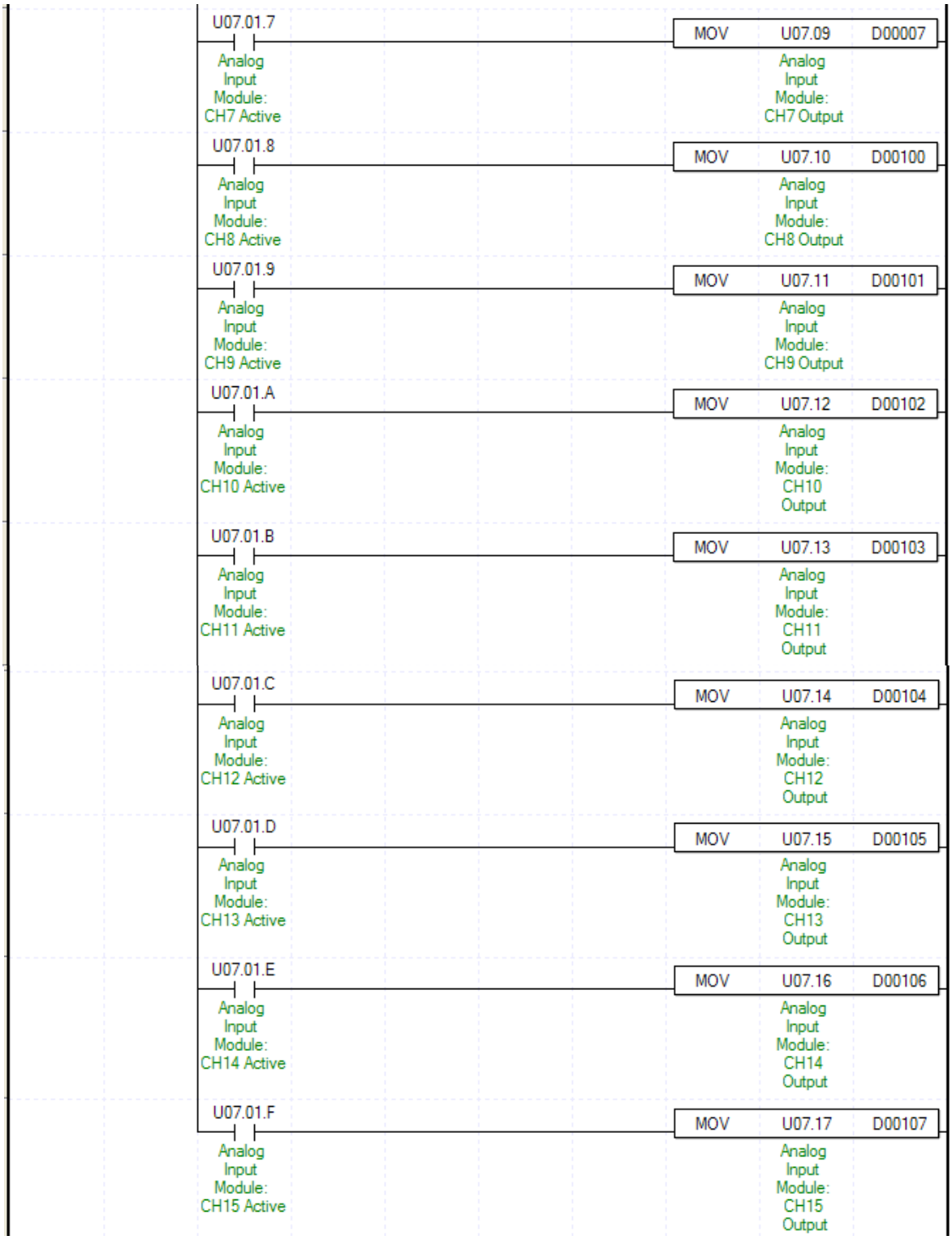


(3) Select [View] -> [Devices/Variables]. Devices and variables are both displayed.



(4) Select [View] -> [Device/Comments]. Devices and comments are both displayed.




U07.01.7
Analog Input Module: CH7 Active
MOV U07.09 D00007
Analog Input Module: CH7 Output
U07.01.8
Analog Input Module: CH8 Active
MOV U07.10 D00100
Analog Input Module: CH8 Output
U07.01.9
Analog Input Module: CH9 Active
MOV U07.11 D00101
Analog Input Module: CH9 Output
U07.01.A
Analog Input Module: CH10 Active
MOV U07.12 D00102
Analog Input Module: CH10 Output
U07.01.B
Analog Input Module: CH11 Active
MOV U07.13 D00103
Analog Input Module: CH11 Output
U07.01.C
Analog Input Module: CH12 Active
MOV U07.14 D00104
Analog Input Module: CH12 Output
U07.01.D
Analog Input Module: CH13 Active
MOV U07.15 D00105
Analog Input Module: CH13 Output
U07.01.E
Analog Input Module: CH14 Active
MOV U07.16 D00106
Analog Input Module: CH14 Output
U07.01.F
Analog Input Module: CH15 Active
MOV U07.17 D00107
Analog Input Module: CH15 Output

Chapter 5 Configuration and Function of Internal Memory (For XGK)

Analog input module has the internal memory to transmit/receive data to/from PLC CPU.

5.1 Internal Memory Configuration

Configuration of internal memory is as described below.

5.1.1 I/O area of A/D converted data

I/O area of A/D converted data is as displayed in Table 5.1.

[Table 5. 1] I/O area of A/D converted data

Device assigned	Details	R/W	Ref.
UXY.00.0 UXY.00.F	Module ERROR flag Module READY flag	R	
UXY.01.0 UXY.01.1 UXY.01.2 UXY.01.3 UXY.01.4 UXY.01.5 UXY.01.6 UXY.01.7 UXY.01.8 UXY.01.9 UXY.01.A UXY.01.B UXY.01.C UXY.01.D UXY.01.E UXY.01.F	CH0 Run flag CH1 Run flag CH2 Run flag CH3 Run flag CH4 Run flag CH5 Run flag CH6 Run flag CH7 Run flag CH8 Run flag CH9 Run flag CH10 Run flag CH11 Run flag CH12 Run flag CH13 Run flag CH14 Run flag CH15 Run flag	R	
UXY.02	CH0 digital output value	R	
UXY.03	CH1 digital output value	R	
UXY.04	CH2 digital output value	R	
UXY.05	CH3 digital output value	R	
UXY.06	CH4 digital output value	R	
UXY.07	CH5 digital output value	R	
UXY.08	CH6 digital output value	R	
UXY.09	CH7 digital output value	R	
UXY.10	CH8 digital output value	R	
UXY.11	CH9 digital output value	R	
UXY.12	CH10 digital output value	R	
UXY.13	CH11 digital output value	R	
UXY.14	CH12 digital output value	R	
UXY.15	CH13 digital output value	R	
UXY.16	CH14 digital output value	R	
UXY.17	CH15 digital output value	R	

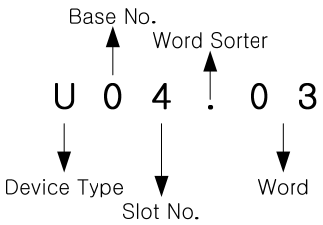
Device assigned	Details	R/W	Ref.
UXY.18.0	Flag to detect CH0 disconnection (1 ~ 5 V or 4 ~ 20 mA)	R	
UXY.18.1	Flag to detect CH1 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.2	Flag to detect CH2 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.3	Flag to detect CH3 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.4	Flag to detect CH4 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.5	Flag to detect CH5 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.6	Flag to detect CH6 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.7	Flag to detect CH7 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.8	Flag to detect CH8 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.9	Flag to detect CH9 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.A	Flag to detect CH10 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.B	Flag to detect CH11 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.C	Flag to detect CH12 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.D	Flag to detect CH13 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.E	Flag to detect CH14 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.18.F	Flag to detect CH15 disconnection (1 ~ 5 V or 4 ~ 20 mA)		
UXY.19.0	Flag to request error clear	W	Less than OS version 1.01
UXY.20.0	CH0 alarm upper limit	R	More than OS version 1.02
UXY.20.1	CH1 alarm upper limit		
UXY.20.2	CH2 alarm upper limit		
UXY.20.3	CH3 alarm upper limit		
UXY.20.4	CH4 alarm upper limit		
UXY.20.5	CH5 alarm upper limit		
UXY.20.6	CH6 alarm upper limit		
UXY.20.7	CH7 alarm upper limit		
UXY.20.8	CH8 alarm upper limit		
UXY.20.9	CH9 alarm upper limit		
UXY.20.A	CH10 alarm upper limit		
UXY.20.B	CH11 alarm upper limit		
UXY.20.C	CH12 alarm upper limit		
UXY.20.D	CH13 alarm upper limit		
UXY.20.E	CH14 alarm upper limit		
UXY.20.F	CH15 alarm upper limit		

Device assigned	Details	R/W	Ref.
UXY.21.0	CH0 alarm lower limit	R	More than OS version 1.02
UXY.21.1	CH1 alarm lower limit		
UXY.21.2	CH2 alarm lower limit		
UXY.21.3	CH3 alarm lower limit		
UXY.21.4	CH4 alarm lower limit		
UXY.21.5	CH5 alarm lower limit		
UXY.21.6	CH6 alarm lower limit		
UXY.21.7	CH7 alarm lower limit		
UXY.21.8	CH8 alarm lower limit		
UXY.21.9	CH9 alarm lower limit		
UXY.21.A	CH10 alarm lower limit		
UXY.21.B	CH11 alarm lower limit		
UXY.21.C	CH12 alarm lower limit		
UXY.21.D	CH13 alarm lower limit		
UXY.21.E	CH14 alarm lower limit		
UXY.21.F	CH15 alarm lower limit		
UXY.22.0	Flag to request error clear	W	More than OS version 1.02

※ R/W is to denote Read/Write if available from PLC program.

(1) In the device assigned, X stands for the Base No. and Y for the Slot No. on which module is installed.

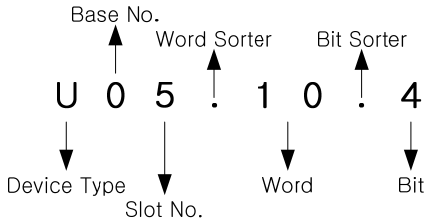
(2) In order to read 'CH1 digital output value' of Analog input module installed on Base No.0, Slot No.4, it shall be displayed as U04.03.



(a) Base number setting range: 0 ~ 7

(b) Slot number setting range: 0 ~ 15

(3) In order to read 'Flag to detect CH4 disconnection' of Analog input module installed on Base No.0, Slot No.5, it shall be displayed as U05.10.4.



5.1.2 Operation parameters setting area

Notes

Operation parameter of analog input module can be set through [I/O Parameter] of XG5000.

For convenience, setting parameter of analog input module is provided GUI(Graphical User Interface) method at XG5000.

Setting area of Analog input module's Run parameters is as described in Table 5.2.

[Table 5. 2] Setting area of Run parameters

Memory address		Details	R/W	Remarks
Hex	Dec			
0_H	0	Channel enable/disable setting	R/W	
1_H	1	Setting ranges of input voltage/current 1		
2_H	2	Setting ranges of input voltage/current 2		
3_H	3	Setting ranges of input voltage/current 3		
4_H	4	Setting ranges of input voltage/current 4		
5_H	5	Output data format setting 1		
6_H	6	Output data format setting 2		
7_H	7	Average process designation 1		
8_H	8	Average process designation 2		
9_H	9	Ch0 average value designation		
A_H	10	Ch1 average value designation		
B_H	11	Ch2 average value designation		
C_H	12	Ch3 average value designation		
D_H	13	Ch4 average value designation		
E_H	14	Ch5 average value designation		
F_H	15	Ch6 average value designation		
10_H	16	Ch7 average value designation		
11_H	17	Ch8 average value designation		
12_H	18	Ch9 average value designation		
13_H	19	Ch10 average value designation		
14_H	20	Ch11 average value designation		
15_H	21	Ch12 average value designation		
16_H	22	Ch13 average value designation		
17_H	23	Ch14 average value designation		
18_H	24	Ch15 average value designation		
19_H	25	Error code		
$1A_H$	26	Hold last value		More than OS version 1.02

.

5.2 A/D Converted Data I/O Area

5.2.1 Module READY/ERROR flag (UXY.00, X: Base No., Y: Slot No.)

1) **UXY.00.F:** It will be ON when PLC CPU is powered or reset with A/D conversion ready to process A/D conversion.
2) **UXY.00.0:** It is a flag to display the error status of Analog input module.

UXY.00

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
RDY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	ERR

⇩ Module READY
Bit ON (1): READY, Bit Off (0): NOT READY

⇩ Error information
Bit ON (1): Error, Bit Off (0): Normal

5.2.2 Run channel flag (UXY.01, X: Base No., Y: Slot No.)

The area where Run information of respective channels is saved

UXY.01

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

Run channel information
Bit ON (1): During Run, Bit Off (0): Operation Stop

5.2.3 Digital output value (UXY.02 ~ UXY.17, X: Base No., Y: Slot No.)

1) A/D converted-digital output value will be output to buffer memory addresses 2 ~ 17 (UXY.02 ~ UXY.17) for respective channels.
2) Digital output value will be saved in 16-bit binary.

UXY.02 ~ UXY.17

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Channel # digital output value															

Address	Details
Address No.2	CH0 digital output value
Address No.3	CH1 digital output value
Address No.4	CH2 digital output value
Address No.5	CH3 digital output value
Address No.6	CH4 digital output value
Address No.7	CH5 digital output value
Address No.8	CH6 digital output value
Address No.9	CH7 digital output value
Address No.10	CH8 digital output value
Address No.11	CH9 digital output value
Address No.12	CH10 digital output value
Address No.13	CH11 digital output value
Address No.14	CH12 digital output value
Address No.15	CH13 digital output value
Address No.16	CH14 digital output value
Address No.17	CH15 digital output value

5.2.4 Flag to detect disconnection (UXY.18.Z, X: Base No., Y: Slot No., Z: Channel No.)

1) Detection sign of disconnection for respective input channels is saved in UXY.18.
2) Each bit will be set to 1 if an assigned channel is detected as disconnected, and it will be back to 0 if connected back. In addition, each bit can be used to detect the disconnection in the user program together with execution conditions.

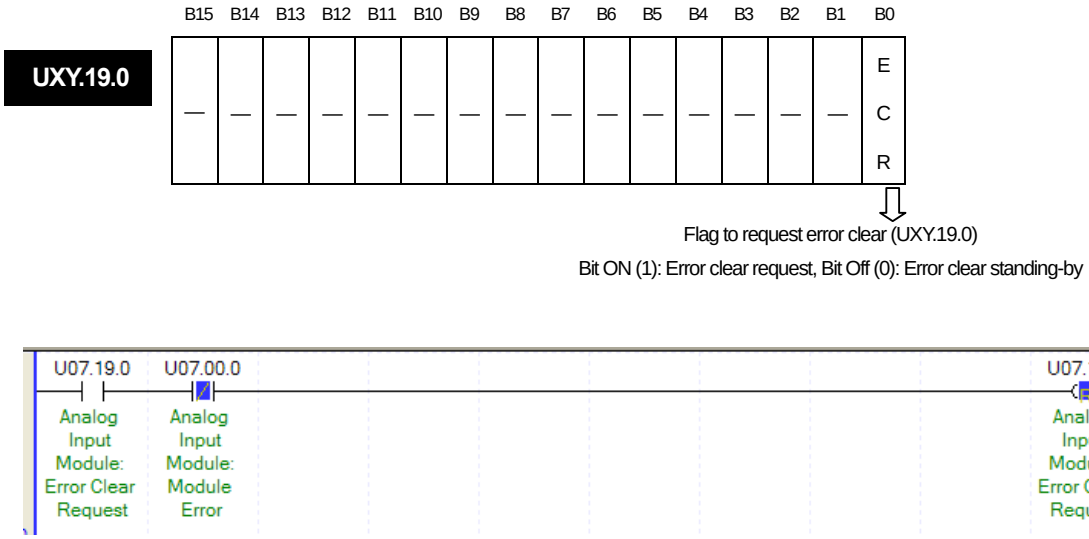
UXY.18

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

BIT	Description
0	Normal
1	disconnection

5.2.5 Flag to request error clear (UXY.19.0, X: Base No., Y: Slot No.)

1) If a parameters setting error occurs, address No.22's error code will not be automatically erased even if parameters are changed correctly. At this time, turn the 'error clear request' bit ON to delete address No.22's error code and the error displayed in XG5000's [System Monitoring]. In addition, RUN LED which blinks will be back to On status.
2) The 'flag to request error clear' shall be used surely together with UXY.00.0 attached thereon for guaranteed Normal operation. Its application shall be as shown below in Fig. 5.1.



[Fig. 5. 1] How to use the flag

5.2.6 Flag to request error clear (UXY.22.0, X: base number, Y: slot number)

(1) In more than OS version 1.02, address UXY.22.0 is used for error clear request flag. Except address, all functions are same with error clear request flag used at previous version.

(2) In less than OS version 1.02, use address UXY.19.0 for error clear request flag

5.3 Operation Parameters Setting Area

▶ 1 word is assigned for each address in the internal memory, which can be displayed in 16 bits.
▶ If each bit of 16 bits configuring the address is On, let it set to “1”, and if it is Off, let it set to “0” so to realize the respective functions.

5.3.1 How to specify the channel to use (address No.0)

1) Allowed/Prohibited A/D conversion can be set for respective channels.
2) Set the unused channel Prohibited from converted so to reduce the conversion cycle for respective channels.
3) If the channel to use is not specified, all the channels will be set to Prohibited.
4) Allowed/Prohibited A/D conversion is as specified below.

Address “0”

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

BIT	Description
0	Disable
1	Enable

5.3.2 How to specify the range of input voltage/current (address No.1)

1) The range of analog input voltage/current can be specified for respective channels.
2) If the analog input range is not specified, the range of all the channels will be set to 4 ~ 20 mA.
3) Setting range of analog input voltage/current is as specified below.

Address “1”

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH3				CH2				CH1				CH0			

Address “2”

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH7				CH6				CH5				CH4			

Address "3"

B15 B14 B13 B12	B11 B10 B9 B8	B7 B6 B5 B4	B3 B2 B1 B0
CH 11	CH 10	CH 9	CH 8

Address"4"

B15 B14 B13 B12	B11 B10 B9 B8	B7 B6 B5 B4	B3 B2 B1 B0
CH 15	CH 14	CH 13	CH 12

BIT	Description
0000	4 mA ~ 20 mA
0001	0 mA ~ 20 mA
0010	1 V ~ 5 V
0011	0 V ~ 5 V
0100	0 V ~ 10 V
0101	-10 V ~ 10 V

5.3.3 How to specify the range of output data (address No.5~ address No.6)

1) The range of digital output data for analog input can be specified for respective channels.
2) If the output data range is not specified, the range of all the channels will be set to 0 ~ 16000.
3) Setting range of digital output data range is as specified below.

Address"5"

B15 B14	B13 B12	B11 B10	B9 B8	B7 B6	B5 B4	B3 B2	B1 B0
CH 7	CH 6	CH 5	CH 4	CH 3	CH 2	CH 1	CH 0

Address"6"

B15 B14	B13 B12	B11 B10	B9 B8	B7 B6	B5 B4	B3 B2	B1 B0
CH 15	CH 14	CH 13	CH 12	CH 11	CH 10	CH 9	CH 8

BIT	Description
00	0 ~ 16000
01	-8000 ~ 8000
10	Precise Value
11	0 ~ 10000

Precise value has the following digital output range about analog input range.

(a) Current

Analog input / Digital output	4 ~ 20 ㎃	0 ~ 20 ㎃
Precise Value	4000 ~ 20000	0 ~ 20000

(b) Voltage

Analog input / Digital output	-10 ~ 10 V	0 ~ 10 V	0 ~ 5 V	1 ~ 5 V
Precise Value	-10000 ~ 10000	0 ~ 10000	0 ~ 5000	1000 ~ 5000

5.3.4 How to specify average process (address No.7~address No.8)

1) Allowed/Prohibited filter process can be specified for respective channels.
2) If the filter process is not specified, all the channels will be sampled.
3) Setting of the filter process is as specified below.

Address "7"

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH7		CH6		CH5		CH4		CH3		CH2		CH1		CH0	

Address "8"

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH15		CH14		CH13		CH12		CH11		CH10		CH9		CH8	

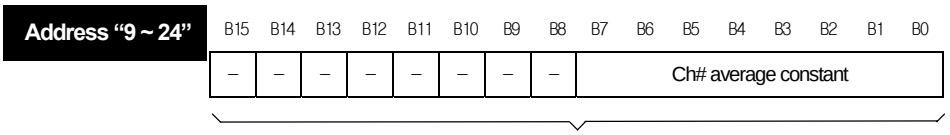
BIT	Description
00	Sampling
01	Time average
10	Count average
11	Weighted average

5.3.5 How to specify average value (address No.9 ~ 24)

(1) Setting range of average value is as follows.
  (a) Time average setting range: 16 ~ 16000(ms)
  (b) Count average setting range: 2 ~ 64000(times)
  (c) Weighted average setting range: 1 ~ 99(%)

(2) In case other value exceeding the setting range is specified, (1) Error No. 60# will be displayed if time average range exceeded, and (2) Error No. 70# will be displayed if count average range exceeded (3) Error No. 80# will be displayed if weighted average value range exceeded on the display address of the respective error codes.
  At this time, the default of average process will be applied and calculated.
  (# at error code means channel where error occurs.)

(3) Time/Count/Weighted average process value setting is as follows



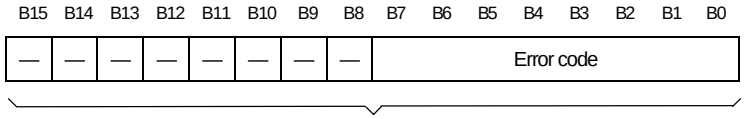
Time average process value setting range is 16 ~ 16000
Count average process value setting range is 2 ~ 64000
Weighted average process value setting range is 1 ~ 99

Address	Contents
Address 9	Ch0 average process value setting
Address 10	Ch1 average process value setting
Address 11	Ch2 average process value setting
Address 12	Ch3 average process value setting
Address 13	Ch4 average process value setting
Address 14	Ch5 average process value setting
Address 15	Ch6 average process value setting
Address 16	Ch7 average process value setting
Address 17	Ch8 average process value setting
Address 18	Ch9 average process value setting
Address 19	Ch10 average process value setting
Address 20	Ch11 average process value setting
Address 21	Ch12 average process value setting
Address 22	Ch13 average process value setting
Address 23	Ch14 average process value setting
Address 24	Ch15 average process value setting

5.3.6 Error code (address No.25)

1) Error codes detected from Analog input module will be saved.
2) Error types and details are as specified below.

Address "25"



Refer to the table below for detailed error codes.

Error code (DEC)	Error details	Remarks
0	Normal Run	RUN LED on
11	Module error (ASIC RAM or Register Error)	RUN LED flickers every 0.2 sec.
20	Module error (A/D Conversion Error)	
1##	Module error (Offset value with the range of 4 ~ 20 mA is set greater than or equal to Gain value.)	RUN LED flickers every 1 sec.
2##	Module error (Offset value with the range of 0 ~ 20mA is set greater than or equal to Gain value.)	
3##	Module error (Offset value with the range of 1 ~ 5V is set greater than or equal to Gain value.)	
4##	Module error (Offset value with the range of 0 ~ 5V is set greater than or equal to Gain value.)	
5##	Module error (Offset value with the range of 0 ~ 10V is set greater than or equal to Gain value.)	
6##	Module error (Offset value with the range of -10 ~ 10V is set greater than or equal to Gain value.)	
7##	Time average setting range exceeded	
8##	Count average setting range exceeded	
9##	Weighted average setting range exceeded	

※ # of the error code stands for the channel with error found.
※ Refer to 9.1 for more details on error codes.

3) If 2 or more errors occur, the module will not save other error codes than the first error code found.
4) If an error found is corrected, use the 'flag to request error clear' (refer to 5.2.5), or let power OFF → ON in order to stop LED blinking and to delete the error code.

5.3.7 Hold last value (Address 26)

(1) If you enable this function, when input value exceeds the effective range, holds the last value. For example, in case of 4~20mA, if input signal change from 10mA to 3mA shortly, channels holds output value corresponding to 10mA.
(2) If this function is enabled, channel indicates digital output value within effective range. For effective range, refer to chapter 2.4 I/O conversion characteristic.
(3) This function is available in the following input range.
  (a) 4 ~ 20 mA
  (b) 0 ~ 20 mA
(4) Setting is as follows.
.

Address"26"

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH 15	CH 14	CH 13	CH 12	CH 11	CH 10	CH 9	CH 8	CH 7	CH 6	CH 5	CH 4	CH 3	CH 2	CH 1	CH 0

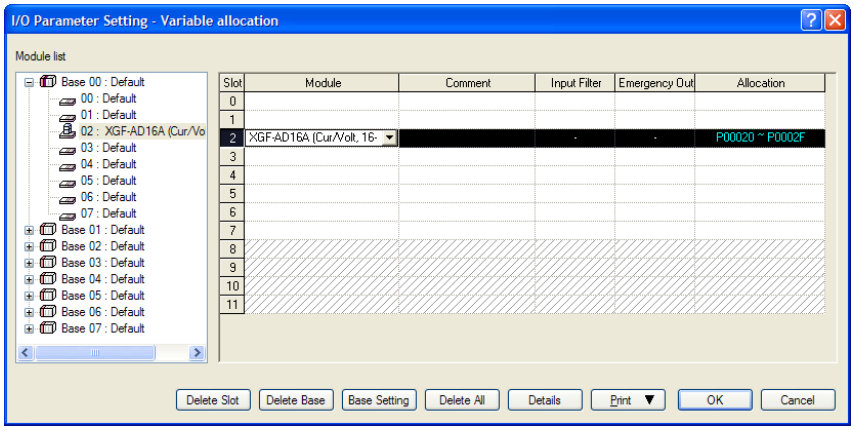
BIT	Description
0	Disable
1	Enable

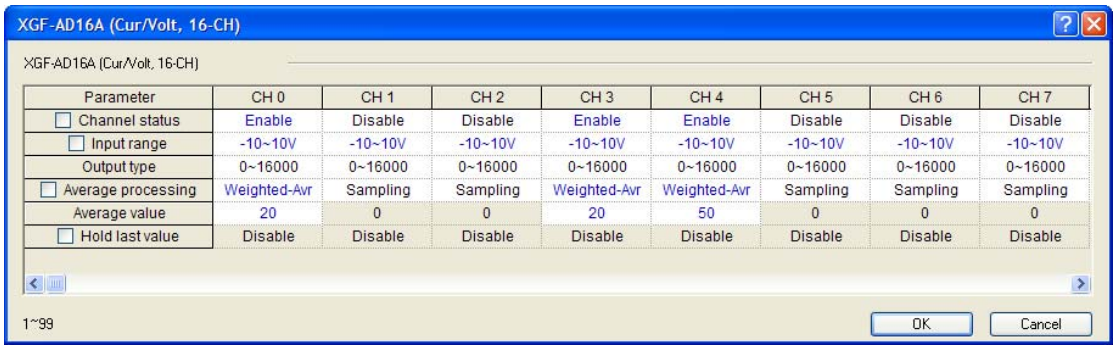
Chapter 6 Programming (For XGK)

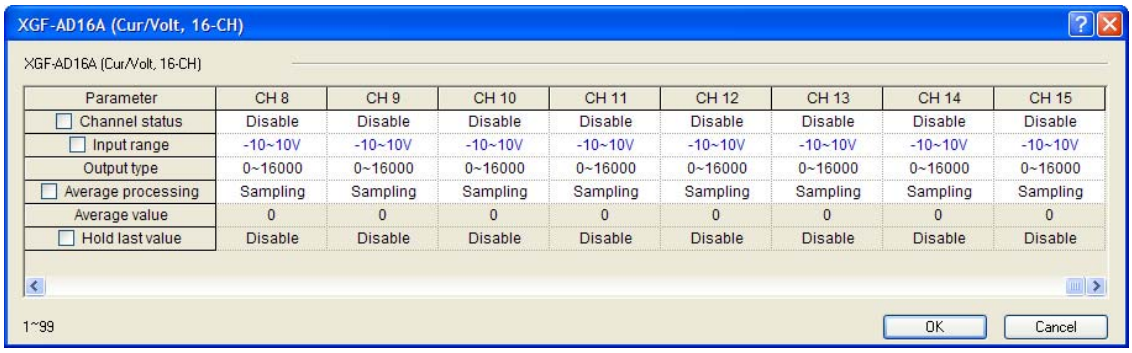
6.1 Basic Program

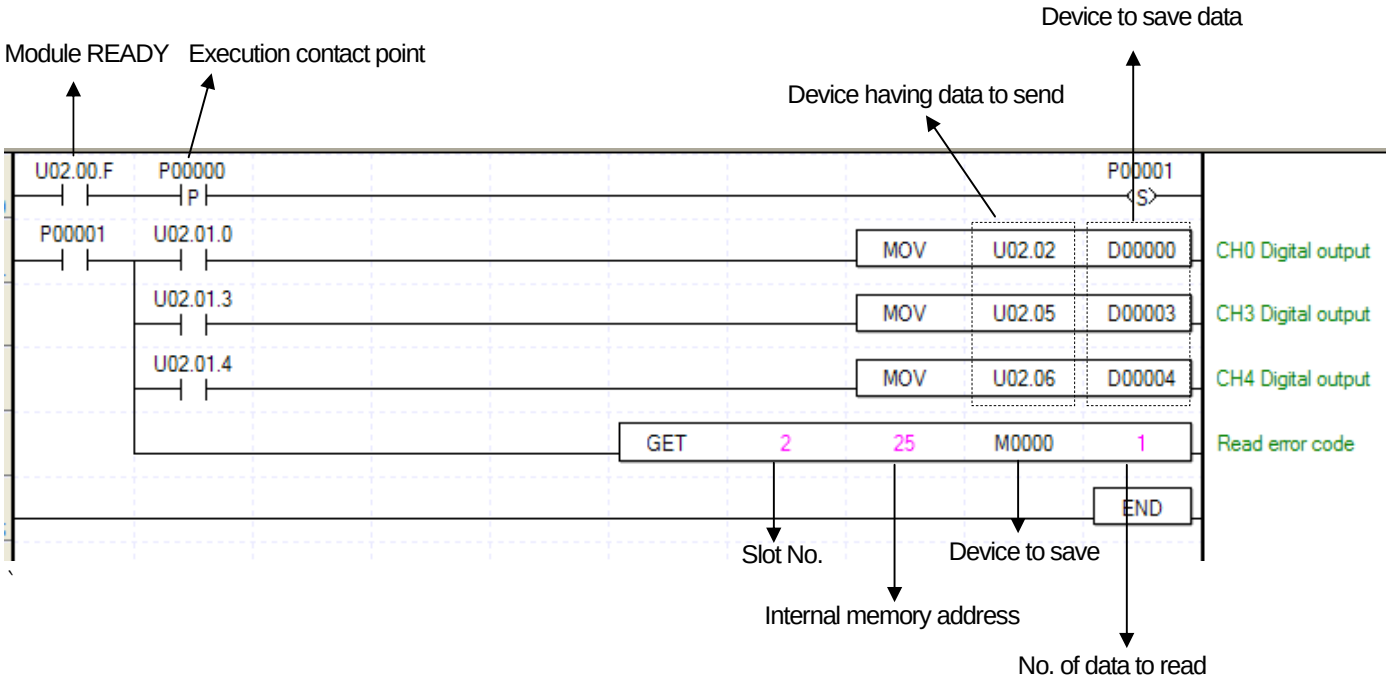
- Describes how to set about operation condition at internal memory of analog input module.
- Analog input module is equipped at slot 2.
- IO occupation point of analog input module is 16. (changeable type)
- Initial setting condition is one time input and initial setting is saved at internal memory of analog input module.

6.1.1 Program example using [I/O Parameter] setting

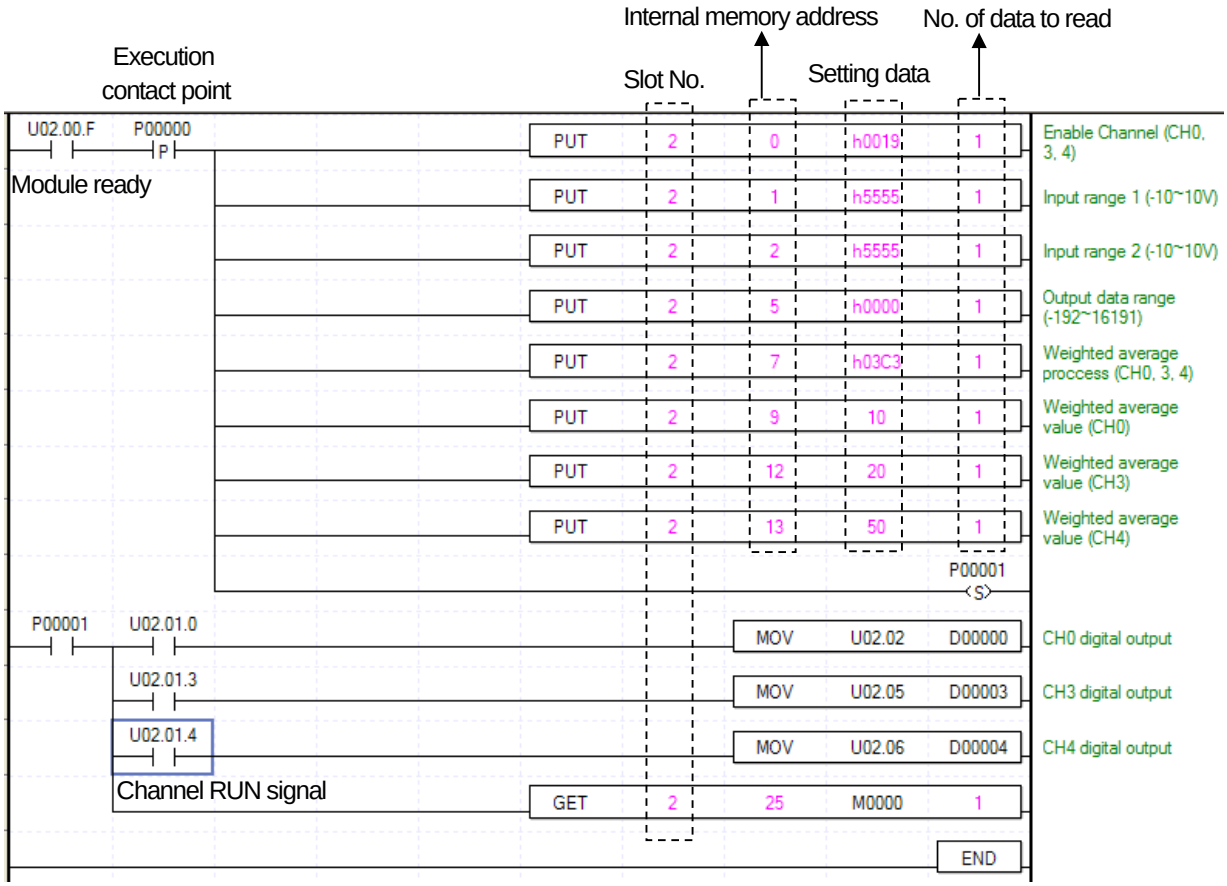








6.1.2 Program example using PUT/GET instruction



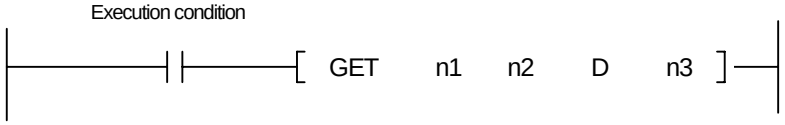
6.2 Read/Write of Operation Parameters Setting Area

Configuration of the internal memory is described as below.

6.2.1 Read of operation parameters setting area (GET, GETP instruction)

Type

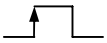
GET instruction
Execution condition



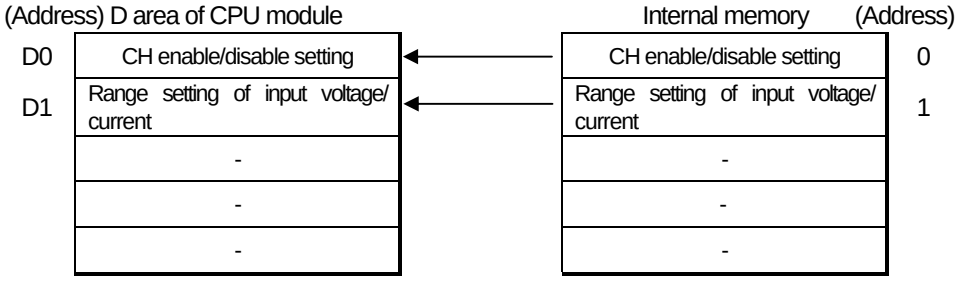
Type	Description	Area available
n1	Slot No. the special module is installed on	Integer
n2	Start address of setting area of special module's Run parameters to read data.	Integer
D	Device's start address with saved data to read	M, P, K, L, T, C, D, #D
n3	Number of words data to read	Integer

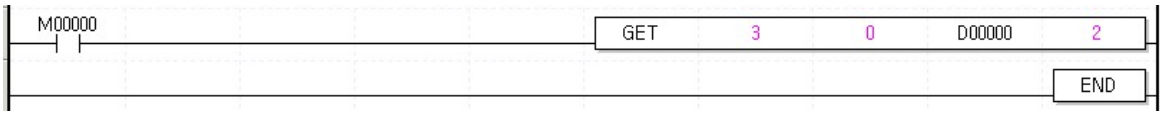
< Difference between GET instruction and GETP instruction >

GET : always executed with execution condition On ( )

GETP : executed with execution condition of operation start ()

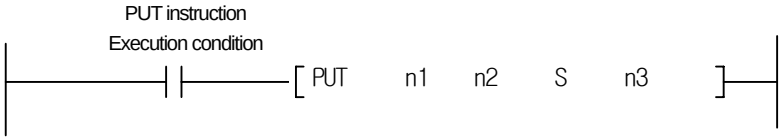
Ex. If Analog input module is installed on Base No.0 and Slot No.3, and internal memory addresses No.0 & 1's data in Analog input module is read to D0 and D1 of CPU module,





6.2.2 Write of operation parameters setting area (PUT, PUTP instruction)

Type

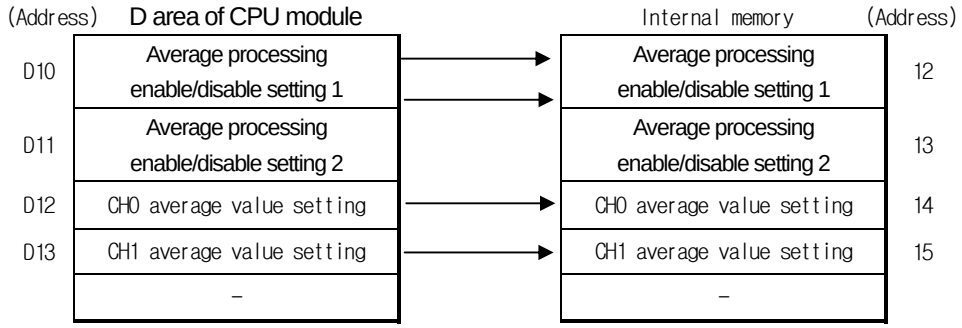


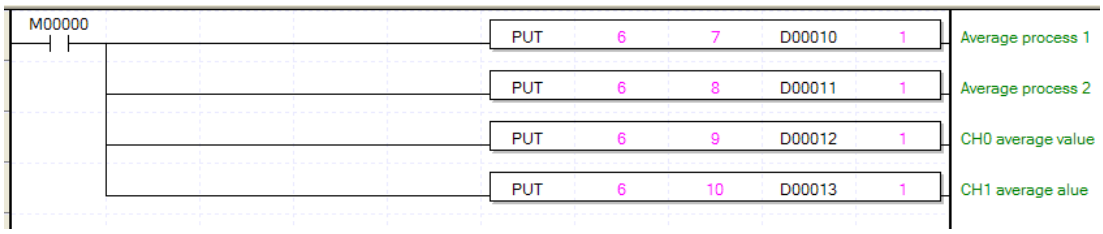
Type	Description	Area available
n1	Slot No. the special module is installed on	Integer
n2	Start address of special module's internal memory to write data.	Integer
S	Device's start address or integer with saved data to write.	M,P,K,L,T,C,D,#D
n3	Number of words data to write	Integer

< Difference between PUT instruction and PUTP instruction >

PUT : always executed with execution condition On ( )
PUTP : executed with execution condition of operation start ( )

Ex. If Analog input module is installed on Base No.0 and Slot No.6, and CPU module's data of D10~D13 is written on internal memory addresses 7~10 of Analog input module,





6.3 Application Program

6.3.1 Program to sort A/D converted value in size (I/O slot fixed-points assigned: based on 64)

(1) System configuration

XGP-ACF2	XGK-CPUS	XGI-D24A	XGF-AD16A	XGQ-RY2A	

(2) Details of initial setting

No.	Item	Details of initial setting	Internal memory address	Value to write on internal memory
1	Used CH	CH0, CH2, CH4	0	'h0015' or '21'
2	Input range	-10 ~ 10 V	1, 2	'hFFFF' or '65535'
3	Output data range	0 ~ 16000	3	'h0000' or '0'
4	Average process	CH2: Count average CH4: Time average	4	'h0120' or '288'
5	Average value	CH2 count average value: 100 (times)	7	'h0064' or '100'
		CH4 time average value: 200(ms)	9	'h00C8' or '200'

(3) Program description

(a) If CH 0's digital value is less than 12000, Contact No.0 (P00080) of relay output module installed on Slot No.2 will be On

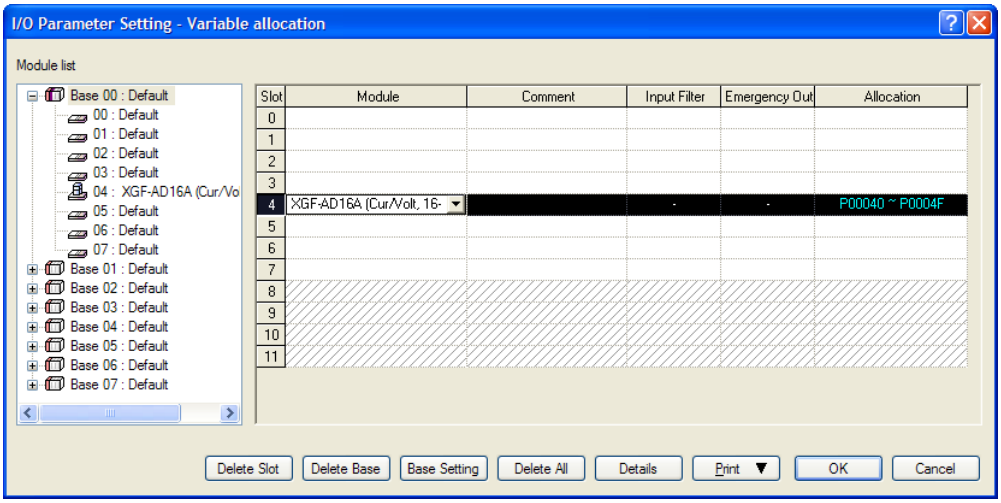
(b) If CH 2's digital value is greater than 13600, Contact No.2 (P00082) of relay output module installed on Slot No.2 will be On.

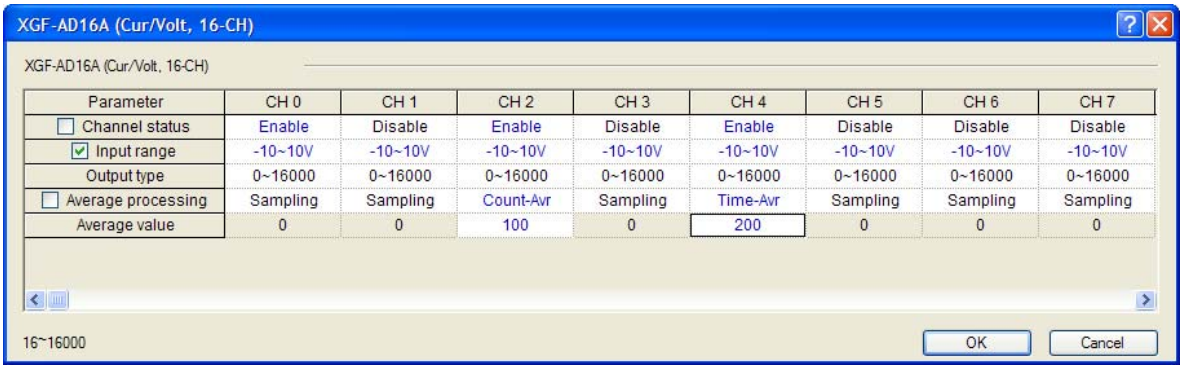
(c) If CH 4's digital value is greater than or equal to 12000 and less than or equal to 13600, Contact No.4 (P00086) of relay output module installed on Slot No.2 will be On.

(d) If CH 4's digital value is equal to 13600, Contact No.5 (P00085) of relay output module installed on Slot No.2 will be On

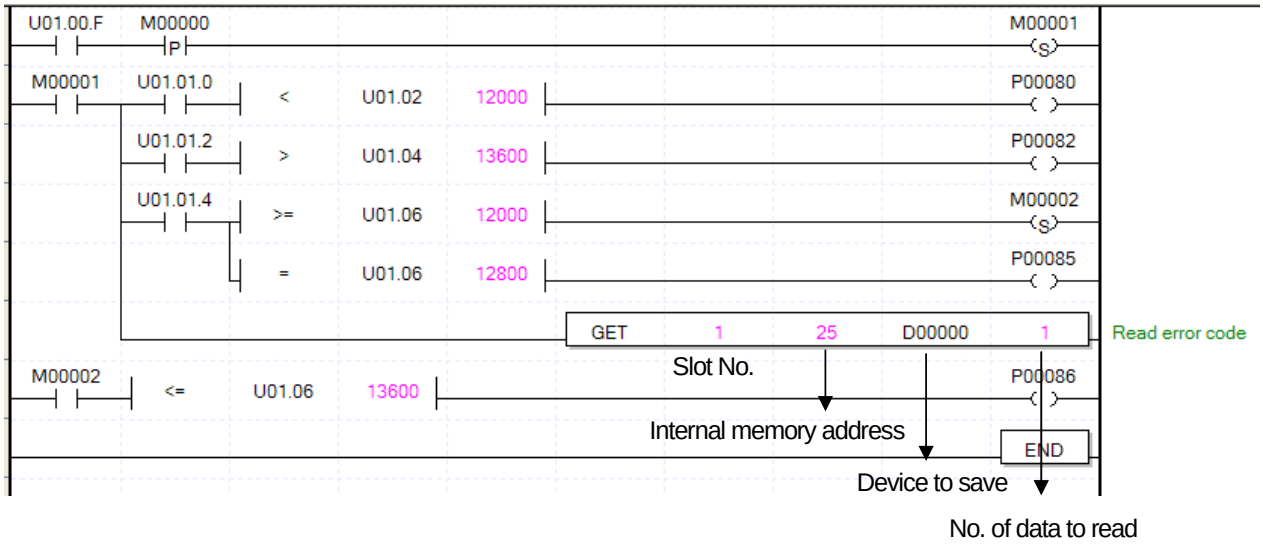
(4) Program

(a) Program example using [I/O parameters] setting

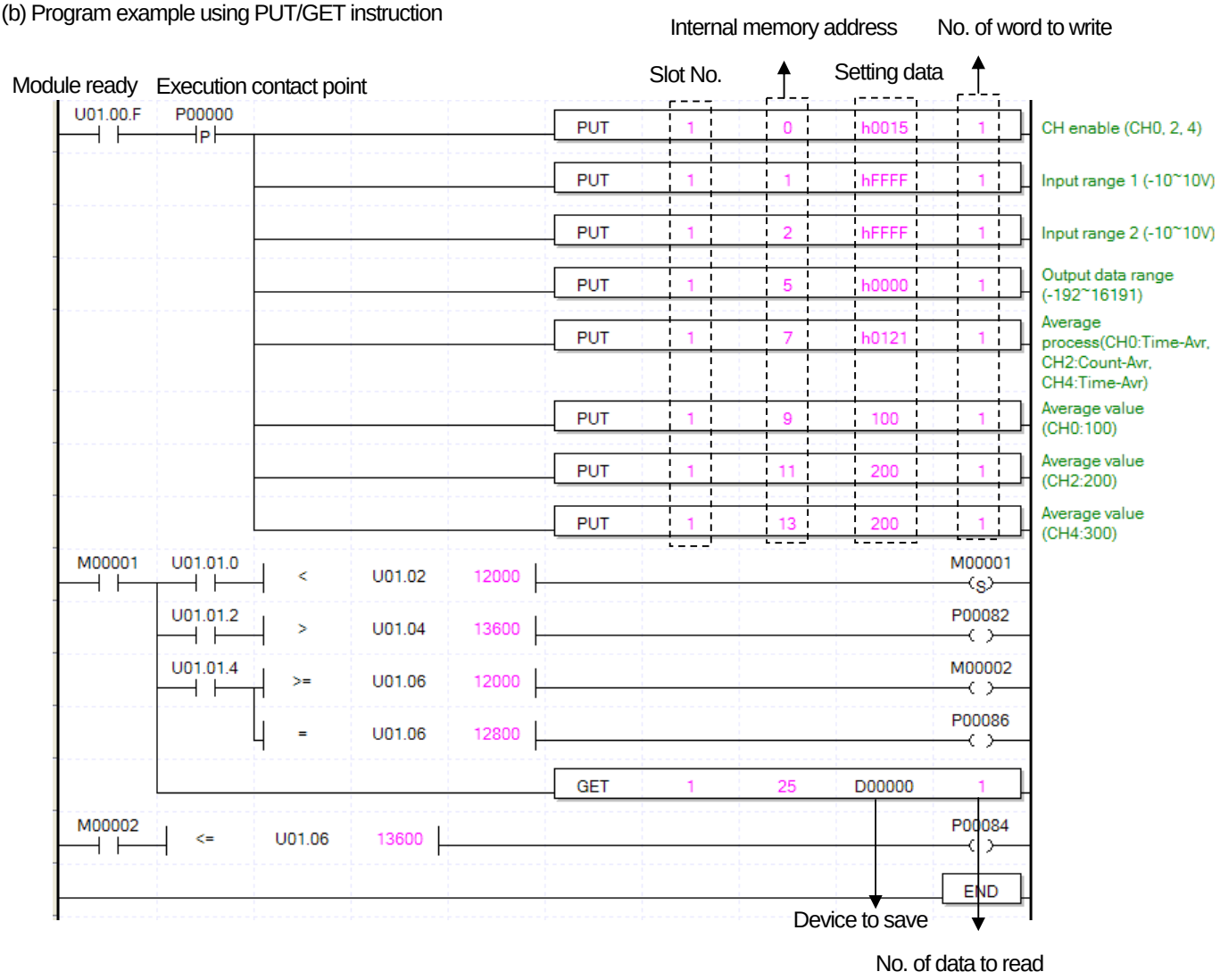




Module ready Execution contact point

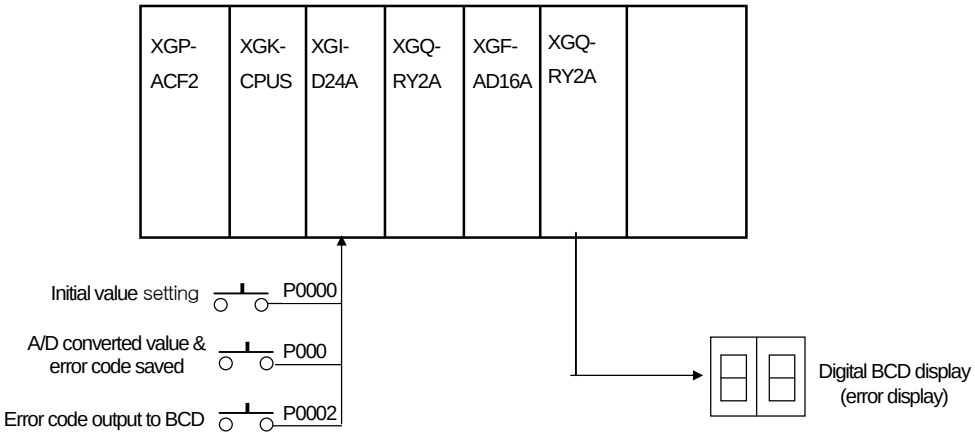


(b) Program example using PUT/GET instruction



6.3.2 Program to output error codes of analog input module to BCD display

(1) System configuration



(2) Details of initial setting

(a) Used CH: CH 0

(b) Analog input current range: DC 4 ~ 20 mA

(c) Time average process setting: 100 (ms)

(d) Digital output data range: 0 ~ 16000

(3) Program description

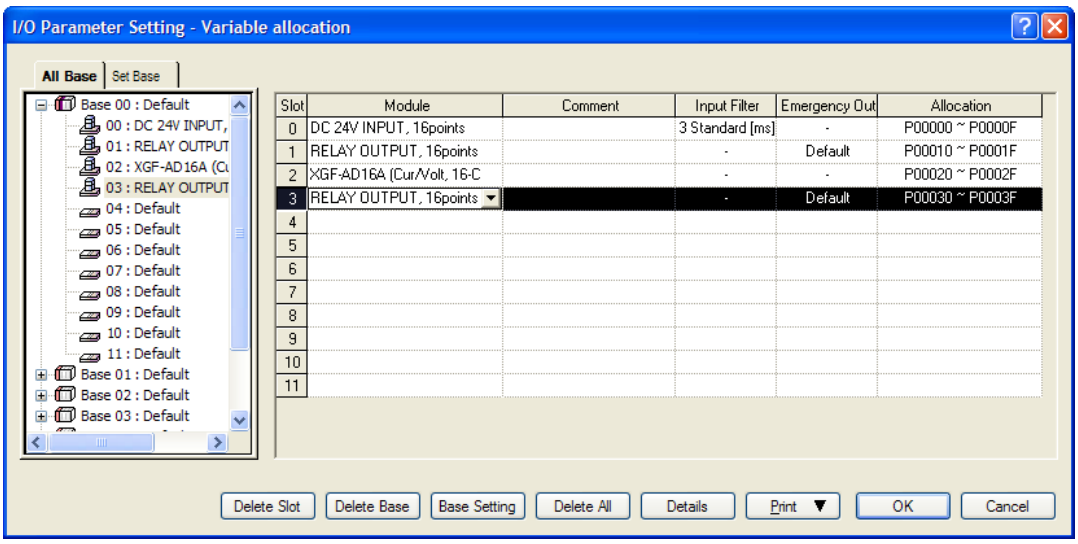
(a) If P00000 is On, A/D conversion will be initially specified.

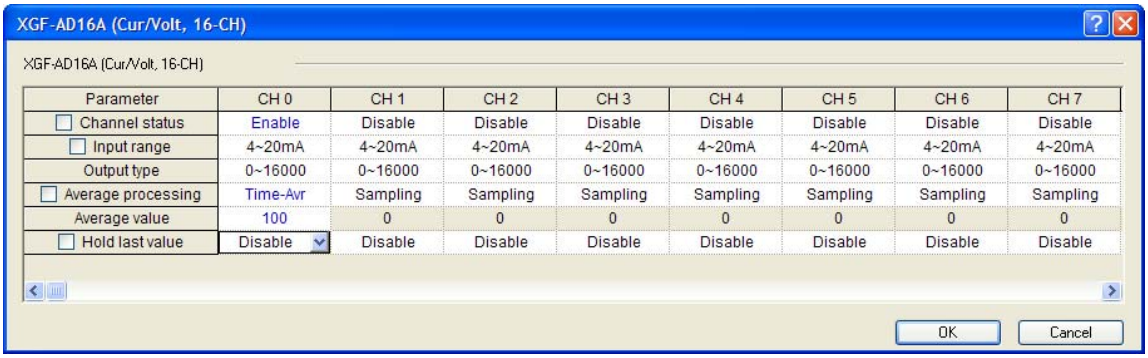
(b) If P00001 is On, A/D converted value and error code will be saved respectively on D00000 and D00001.

(c) If P00002 is On, applicable error code will be output to digital BCD display. (P00040 ~ P0004F)

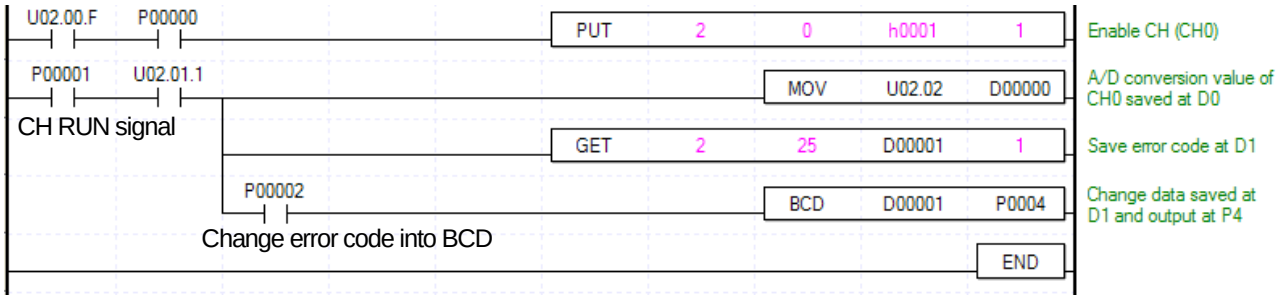
(4) Program

(a) Program example through [I/O parameters] setting

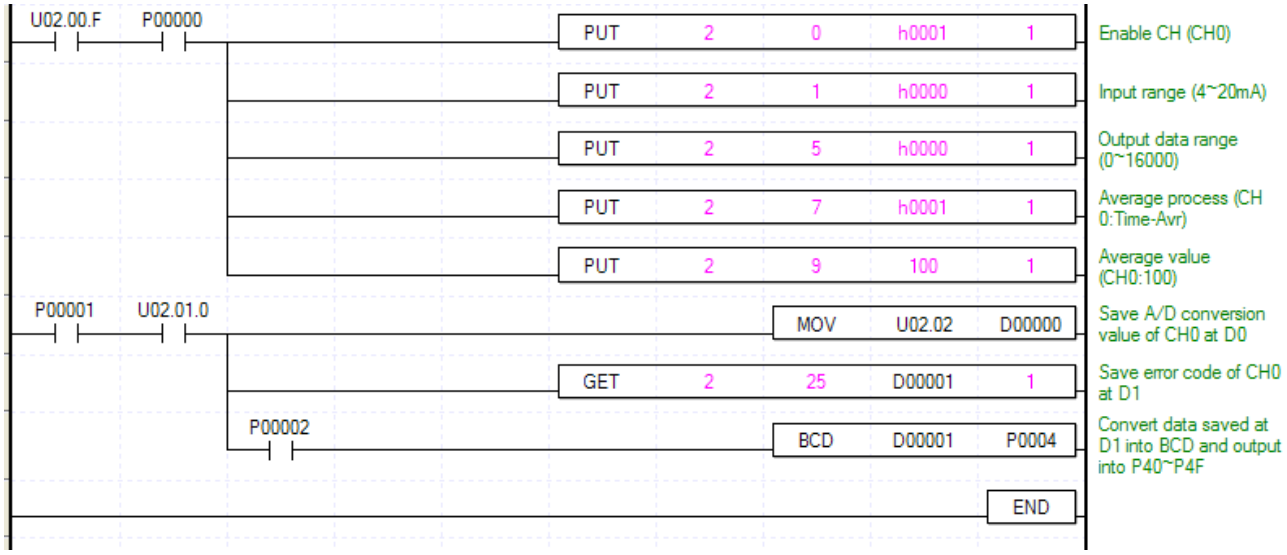




Module ready Execution contact point



(b) Program example using PUT/GET instruction



Chapter 7 Configuration and Function of Global variable (For XGI/XGR)

7.1 Global Variable (Data area)

7.1.1 A/D conversion data IO area configuration

Indicates A/D conversion data IO area at table 7.1

[Table 7. 1] A/D conversion data IO area

Global variable	Memory allocation	Contents	Read/Write
_xxyy_ERR	%UXxx.yy.0	Module ERROR flag	Read
_xxyy_RDY	%UXxx.yy.15	Module READY flag	
_xxyy_CH0_ACT	%UXxx.yy.16	CH 0 RUN flag	Read
_xxyy_CH1_ACT	%UXxx.yy.17	CH 1 RUN flag	
_xxyy_CH2_ACT	%UXxx.yy.18	CH 2 RUN flag	
_xxyy_CH3_ACT	%UXxx.yy.19	CH 3 RUN flag	
_xxyy_CH4_ACT	%UXxx.yy.20	CH 4 RUN flag	
_xxyy_CH5_ACT	%UXxx.yy.21	CH 5 RUN flag	
_xxyy_CH6_ACT	%UXxx.yy.22	CH 6 RUN flag	
_xxyy_CH7_ACT	%UXxx.yy.23	CH 7 RUN flag	
_xxyy_CH8_ACT	%UXxx.yy.24	CH 8 RUN flag	
_xxyy_CH9_ACT	%UXxx.yy.25	CH 9 RUN flag	
_xxyy_CH10_ACT	%UXxx.yy.26	CH 10 RUN flag	
_xxyy_CH11_ACT	%UXxx.yy.27	CH 11 RUN flag	
_xxyy_CH12_ACT	%UXxx.yy.28	CH 12 RUN flag	
_xxyy_CH13_ACT	%UXxx.yy.29	CH 13 RUN flag	
_xxyy_CH14_ACT	%UXxx.yy.30	CH 14 RUN flag	
_xxyy_CH15_ACT	%UXxx.yy.31	CH 15 RUN flag	
_xxyy_CH0_DATA	%UWxx.yy.2	CH 0 Digital output value (conversion value)	Read
_xxyy_CH1_DATA	%UWxx.yy.3	CH 1 Digital output value (conversion value)	
_xxyy_CH2_DATA	%UWxx.yy.4	CH 2 Digital output value (conversion value)	
_xxyy_CH3_DATA	%UWxx.yy.5	CH 3 Digital output value (conversion value)	
_xxyy_CH4_DATA	%UWxx.yy.6	CH 4 Digital output value (conversion value)	
_xxyy_CH5_DATA	%UWxx.yy.7	CH 5 Digital output value (conversion value)	
_xxyy_CH6_DATA	%UWxx.yy.8	CH 6 Digital output value (conversion value)	
_xxyy_CH7_DATA	%UWxx.yy.9	CH 7 Digital output value (conversion value)	
_xxyy_CH8_DATA	%UWxx.yy.10	CH 8 Digital output value (conversion value)	
_xxyy_CH9_DATA	%UWxx.yy.11	CH 9 Digital output value (conversion value)	
_xxyy_CH10_DATA	%UWxx.yy.12	CH 10 Digital output value (conversion value)	
_xxyy_CH11_DATA	%UWxx.yy.13	CH 11 Digital output value (conversion value)	
_xxyy_CH12_DATA	%UWxx.yy.14	CH 12 Digital output value (conversion value)	
_xxyy_CH13_DATA	%UWxx.yy.15	CH 13 Digital output value (conversion value)	
_xxyy_CH14_DATA	%UWxx.yy.16	CH 14 Digital output value (conversion value)	
_xxyy_CH15_DATA	%UWxx.yy.17	CH 15 Digital output value (conversion value)	

Global variable	Memory allocation	Contents	Read/Write
_xxyy_CH0_IDD	%UXxx.yy.288	CH 0 disconnection detection flag	Read
_xxyy_CH1_IDD	%UXxx.yy.289	CH 1 disconnection detection flag	
_xxyy_CH2_IDD	%UXxx.yy.290	CH 2 disconnection detection flag	
_xxyy_CH3_IDD	%UXxx.yy.291	CH 3 disconnection detection flag	
_xxyy_CH4_IDD	%UXxx.yy.292	CH 4 disconnection detection flag	
_xxyy_CH5_IDD	%UXxx.yy.293	CH 5 disconnection detection flag	
_xxyy_CH6_IDD	%UXxx.yy.294	CH 6 disconnection detection flag	
_xxyy_CH7_IDD	%UXxx.yy.295	CH 7 disconnection detection flag	
_xxyy_CH8_IDD	%UXxx.yy.296	CH 8 disconnection detection flag	
_xxyy_CH9_IDD	%UXxx.yy.297	CH 9 disconnection detection flag	
_xxyy_CH10_IDD	%UXxx.yy.298	CH 10 disconnection detection flag	
_xxyy_CH11_IDD	%UXxx.yy.299	CH 11 disconnection detection flag	
_xxyy_CH12_IDD	%UXxx.yy.300	CH 12 disconnection detection flag	
_xxyy_CH13_IDD	%UXxx.yy.301	CH 13 disconnection detection flag	
_xxyy_CH14_IDD	%UXxx.yy.302	CH 14 disconnection detection flag	
_xxyy_CH15_IDD	%UXxx.yy.303	CH 15 disconnection detection flag	
_xxyy_ERR_CLR	%UXxx.yy.304	Error clear request flag	Write
_xxyy_CH0_HOOR	%UXxx.yy.320	CH0 alarm upper limit	Read
_xxyy_CH1_HOOR	%UXxx.yy.321	CH1 alarm upper limit	
_xxyy_CH2_HOOR	%UXxx.yy.322	CH2 alarm upper limit	
_xxyy_CH3_HOOR	%UXxx.yy.323	CH3 alarm upper limit	
_xxyy_CH4_HOOR	%UXxx.yy.324	CH4 alarm upper limit	
_xxyy_CH5_HOOR	%UXxx.yy.325	CH5 alarm upper limit	
_xxyy_CH6_HOOR	%UXxx.yy.326	CH6 alarm upper limit	
_xxyy_CH7_HOOR	%UXxx.yy.327	CH7 alarm upper limit	
_xxyy_CH8_HOOR	%UXxx.yy.328	CH8 alarm upper limit	
_xxyy_CH9_HOOR	%UXxx.yy.329	CH9 alarm upper limit	
_xxyy_CH10_HOOR	%UXxx.yy.330	CH10 alarm upper limit	
_xxyy_CH11_HOOR	%UXxx.yy.331	CH11 alarm upper limit	
_xxyy_CH12_HOOR	%UXxx.yy.332	CH12 alarm upper limit	
_xxyy_CH13_HOOR	%UXxx.yy.333	CH13 alarm upper limit	
_xxyy_CH14_HOOR	%UXxx.yy.334	CH14 alarm upper limit	
_xxyy_CH15_HOOR	%UXxx.yy.335	CH15 alarm upper limit	

Global variable	Memory allocation	Contents	Read/Write
_xxyy_CH0_LOOR	%UXxx.yy.336	CH0 alarm lower limit	Read
_xxyy_CH1_LOOR	%UXxx.yy.337	CH1 alarm lower limit	
_xxyy_CH2_LOOR	%UXxx.yy.338	CH2 alarm lower limit	
_xxyy_CH3_LOOR	%UXxx.yy.339	CH3 alarm lower limit	
_xxyy_CH4_LOOR	%UXxx.yy.340	CH4 alarm lower limit	
_xxyy_CH5_LOOR	%UXxx.yy.341	CH5 alarm lower limit	
_xxyy_CH6_LOOR	%UXxx.yy.342	CH6 alarm lower limit	
_xxyy_CH7_LOOR	%UXxx.yy.343	CH7 alarm lower limit	
_xxyy_CH8_LOOR	%UXxx.yy.344	CH8 alarm lower limit	
_xxyy_CH9_LOOR	%UXxx.yy.345	CH9 alarm lower limit	
_xxyy_CH10_LOOR	%UXxx.yy.346	CH10 alarm lower limit	
_xxyy_CH11_LOOR	%UXxx.yy.347	CH11 alarm lower limit	
_xxyy_CH12_LOOR	%UXxx.yy.348	CH12 alarm lower limit	
_xxyy_CH13_LOOR	%UXxx.yy.349	CH13 alarm lower limit	
_xxyy_CH14_LOOR	%UXxx.yy.350	CH14 alarm lower limit	
_xxyy_CH15_LOOR	%UXxx.yy.351	CH15 alarm lower limit	
_xxyy_ERR_CTR	%UXxx.yy.352	Error clear request flag (V1.02)	Write

※ At the device allocation, xx means base number and yy means slot number where module is installed.

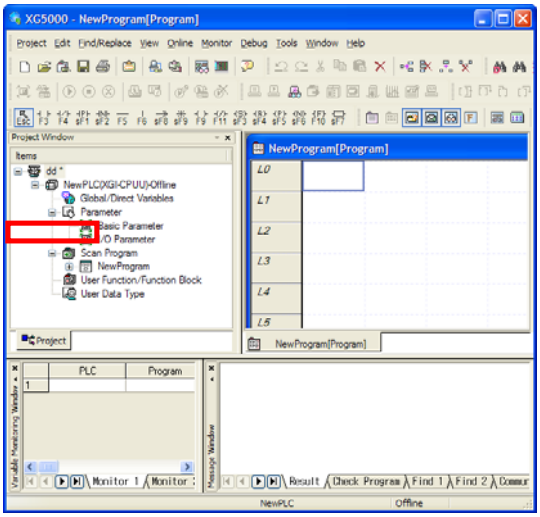
7.1.2 How to use global variable

- In order to register global variable, there are two method, auto registration after setting I/O parameter at project window and batch registration after setting I/O parameter

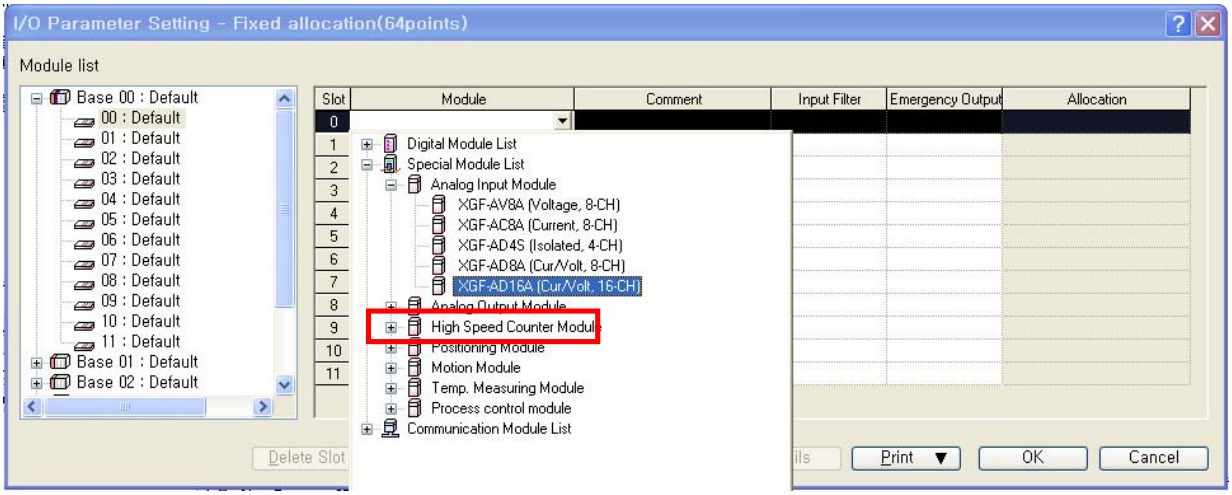
(1) I/O parameter registration

- Registers module you want to use at I/O parameter

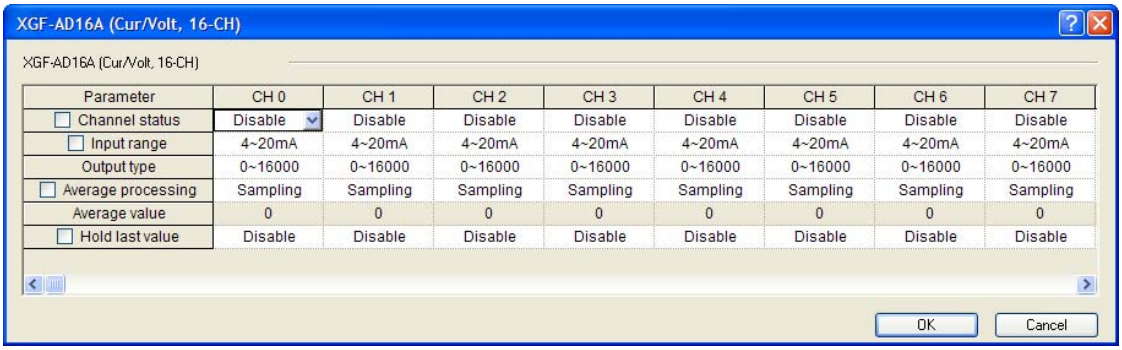
(a) Double-click I/O parameter of project window

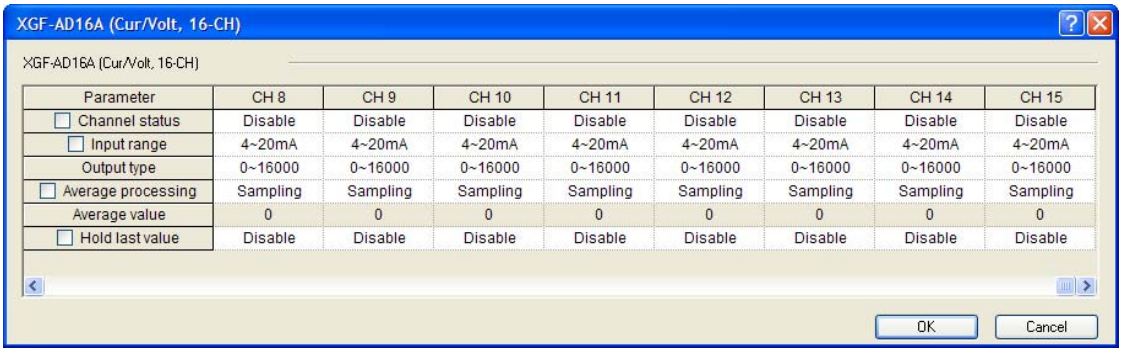


(b) Select XGF-AD16A module at I/O parameter window



(c) Set parameter by pressing [Details] and select [OK]



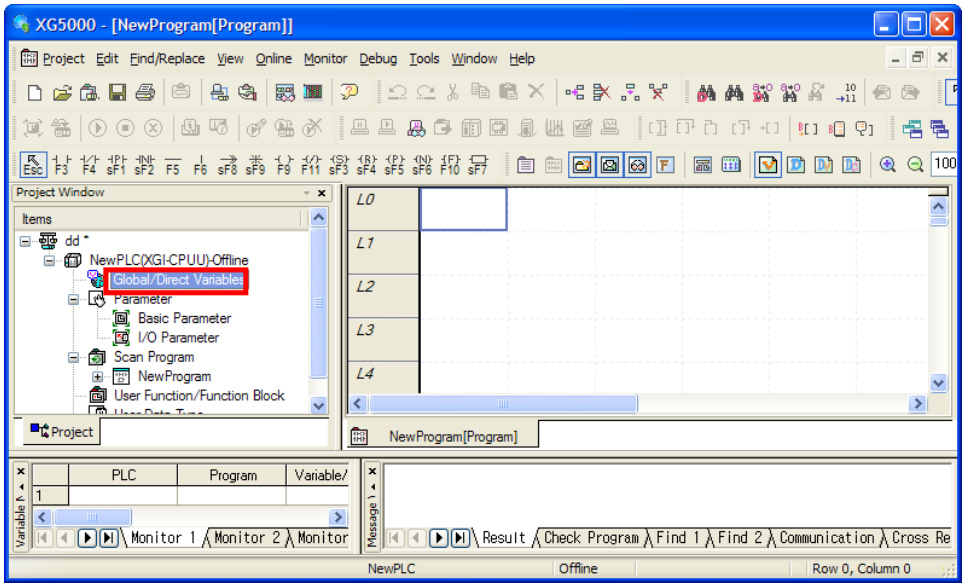


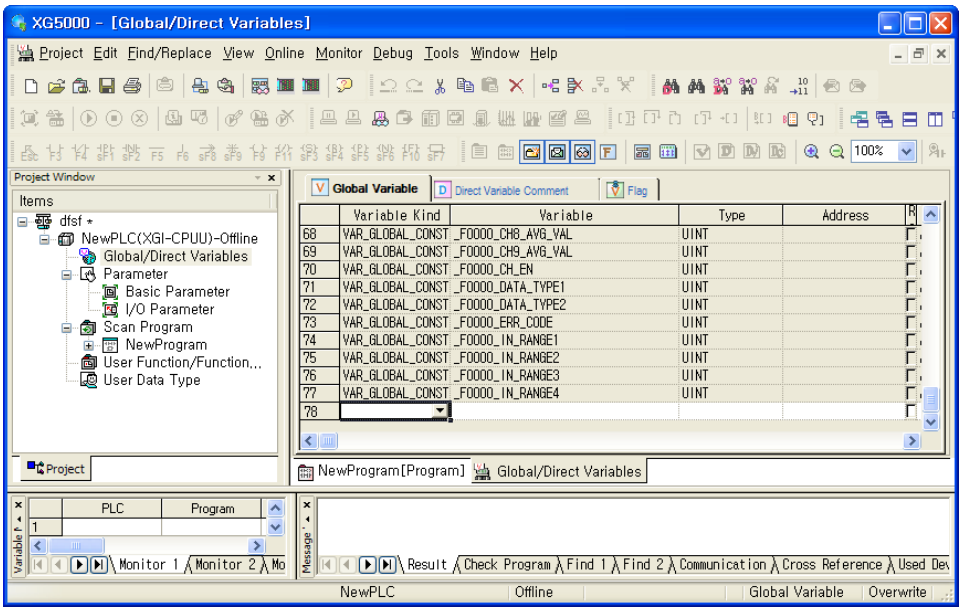
(d) Select [Yes]

- Auto-register global variable of module set in I/O parameter

(e) Global variable auto registration check

- Double-click Global/Direct Variable of project window

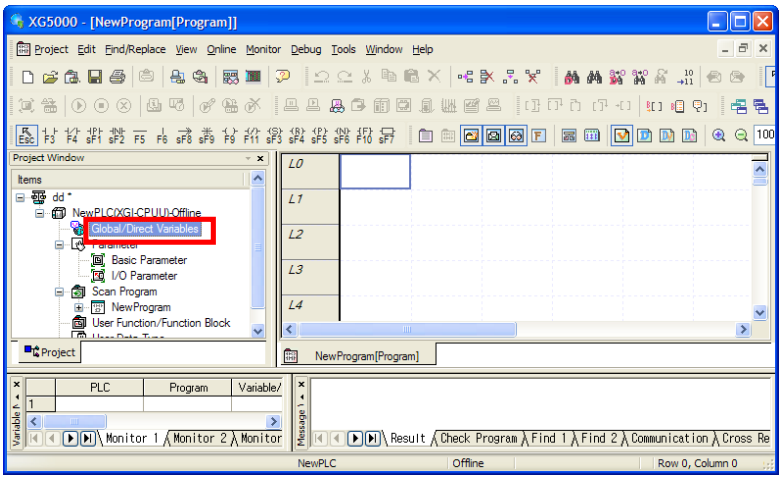




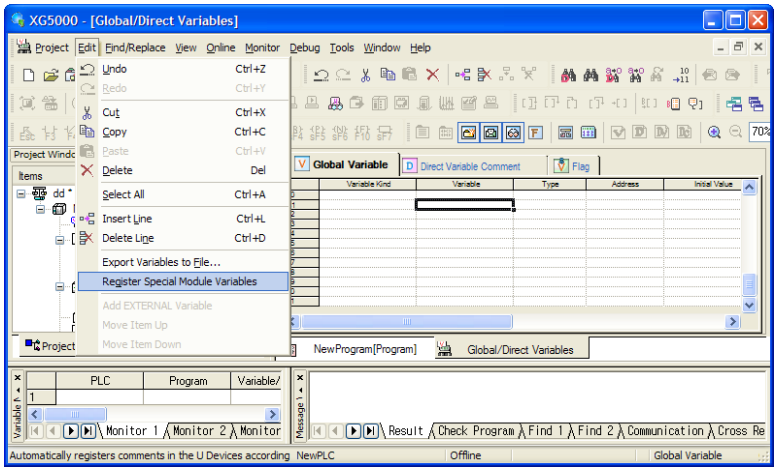
(2) Global variable registration

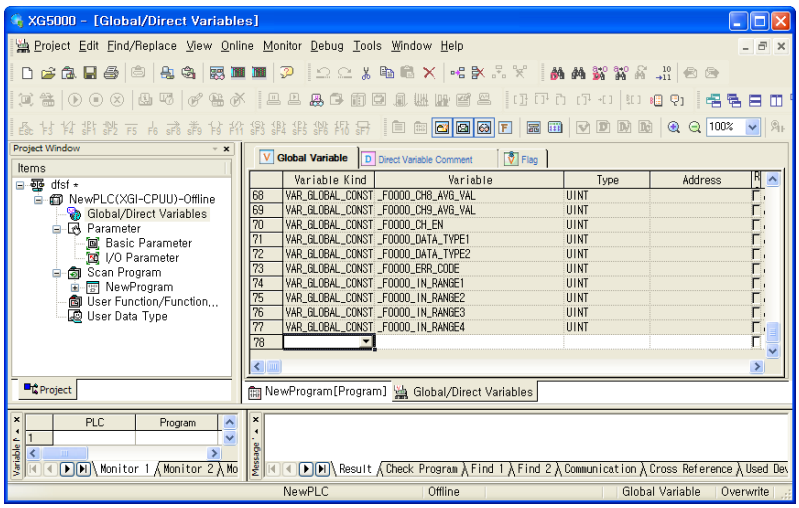
- Registers global variable set in I/O parameter

(a) Double-click Global/Direct Variable of project window



(b) Select [Register Special Module Variables] at menu [Edit]

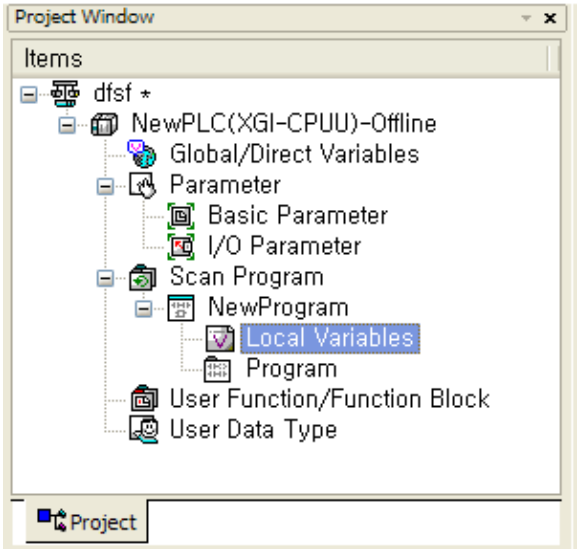




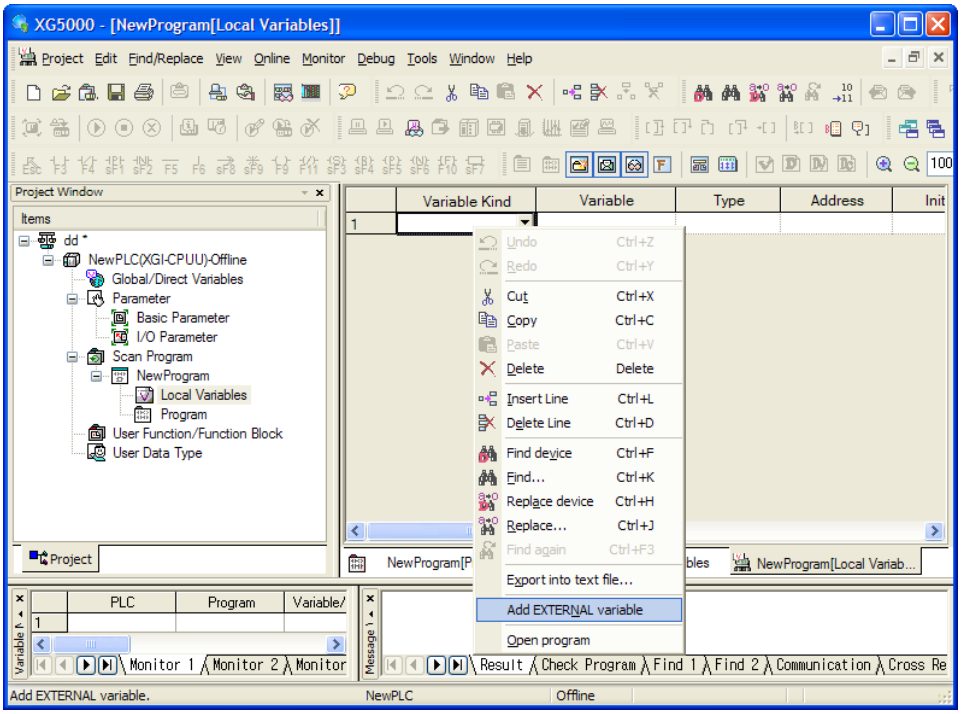
(3) Local variable registration

- Registers variable among registered global variable you want to use as local variable.

(a) Double-click local variable to use in the following scan program.

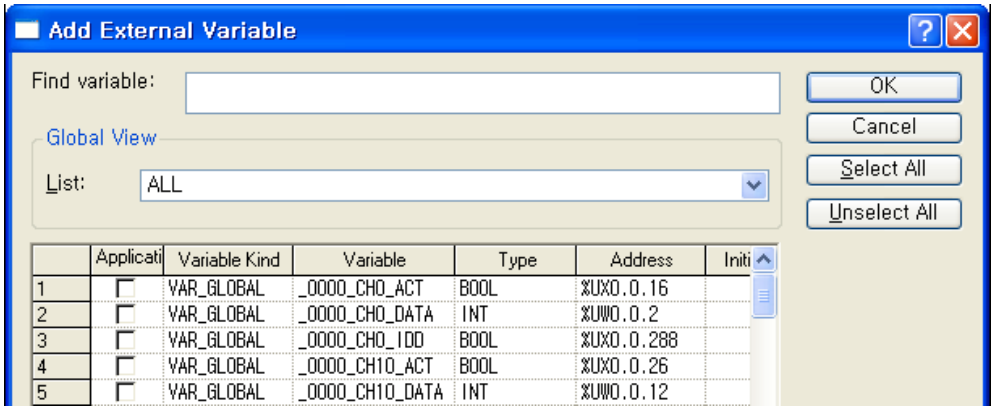


(b) Click right button of mouse in the right local variable window and select “Add EXTERNAL variable”.

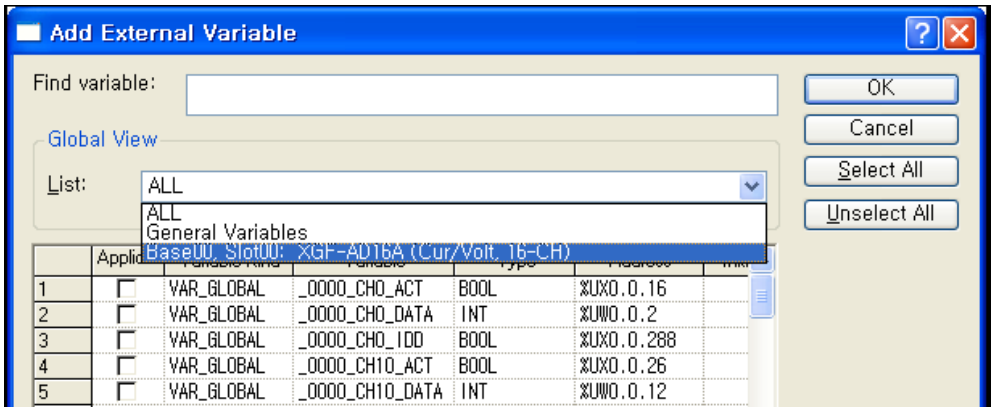


(c) Select local variable to add at Global View on “Add External Variable” window (“All” or “Base, slot”).

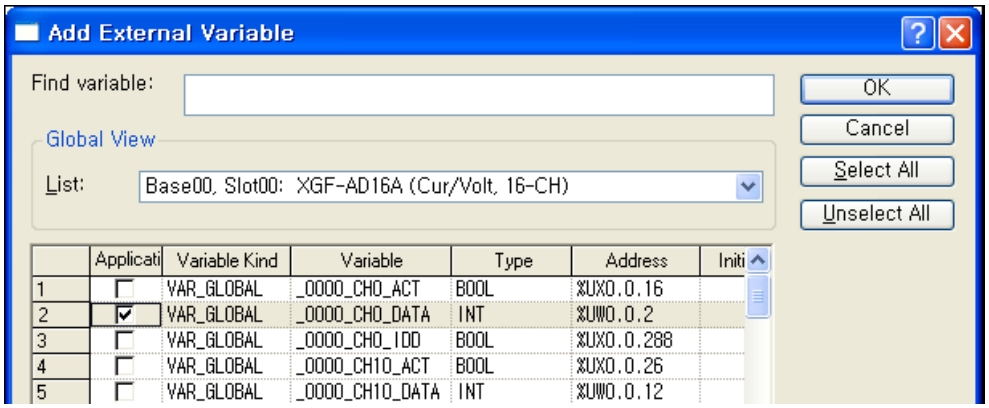
-View All



- View per base, slot



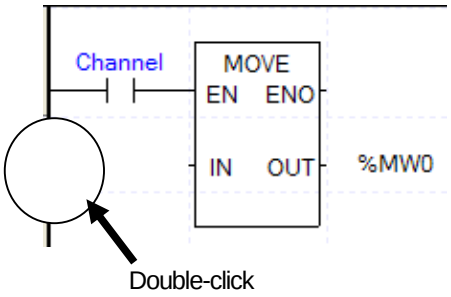
(d) The following is example selecting digital input value (_0000_CH0_DATA) of “Base00, Slot00”.



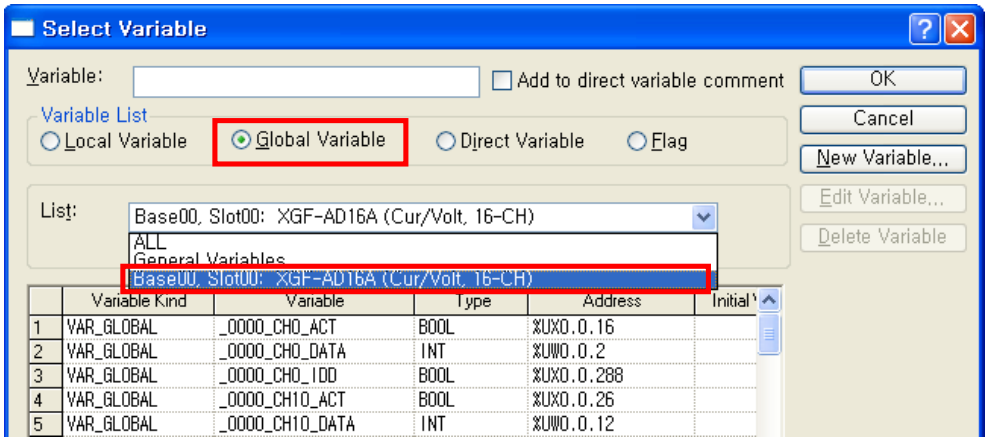
(4) How to use local variable on program

- It describes the added global variable at local program.
- The following is example getting the conversion value of CH0 of Analog input module to %MW0.

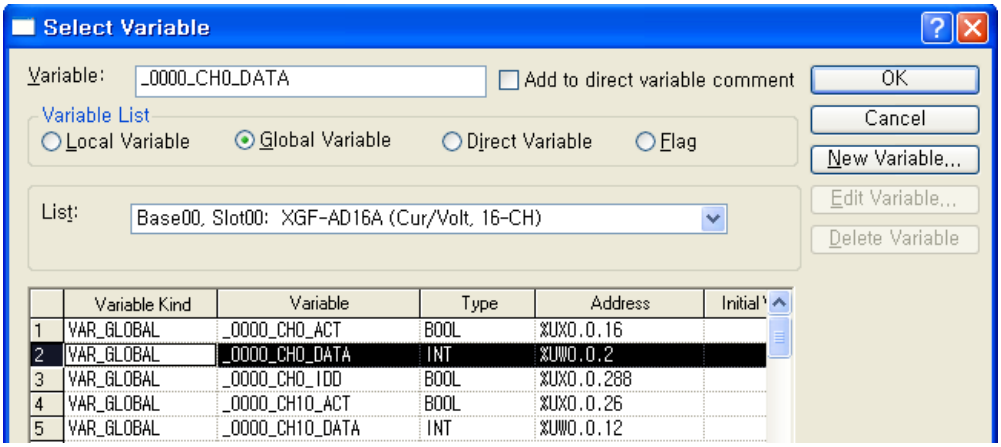
(a) At part reading A/D conversion data to %MW0 by using the following MOVE function, double-click variable part ahead of IN, then “Select Variable” window shows up.



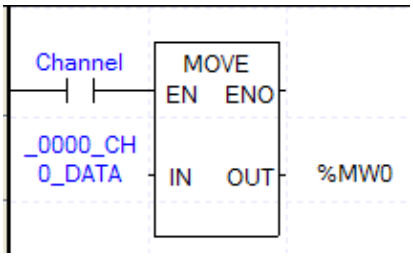
(b) Select global variable at variable type at Select Variable window. And select relevant base (0 base, 0 slot) at global variable view item.



(c) Double-click or select _0000_CH0_DATA corresponding to CH0 A/D conversion data and click [OK].



(d) The following figure is result adding global variable corresponding to CH0 A/D conversion value.



7.2 PUT/GET Function Block use area (Parameter area)

7.2.1 PUT/GET Function Block use area (Parameter area)

It indicates operation parameter setting area of Analog input module at table 7.2.

[Table 7. 2] Operation parameter setting area

Global variable	Contents	Instruction
_Fxxyy_AVG_SEL1	Average process method setting 1	PUT
_Fxxyy_AVG_SEL2	Average process method setting 2	
_Fxxyy_CH_EN	Enable CH	
_Fxxyy_CH0_AVG_VAL	CH0 average value	PUT
_Fxxyy_CH1_AVG_VAL	CH1 average value	
_Fxxyy_CH2_AVG_VAL	CH2 average value	
_Fxxyy_CH3_AVG_VAL	CH3 average value	
_Fxxyy_CH4_AVG_VAL	CH4 average value	
_Fxxyy_CH5_AVG_VAL	CH5 average value	
_Fxxyy_CH6_AVG_VAL	CH6 average value	
_Fxxyy_CH7_AVG_VAL	CH7 average value	
_Fxxyy_CH8_AVG_VAL	CH8 average value	
_Fxxyy_CH9_AVG_VAL	CH9 average value	
_Fxxyy_CH10_AVG_VAL	CH10 average value	
_Fxxyy_CH11_AVG_VAL	CH11 average value	
_Fxxyy_CH12_AVG_VAL	CH12 average value	
_Fxxyy_CH13_AVG_VAL	CH13 average value	
_Fxxyy_CH14_AVG_VAL	CH14 average value	
_Fxxyy_CH15_AVG_VAL	CH15 average value	
_Fxxyy_DATA_TYPE1	Output data type setting 1	PUT
_Fxxyy_DATA_TYPE2	Output data type setting 2	
_Fxxyy_IN_RANGE1	Input current/voltage range setting 1	
_Fxxyy_IN_RANGE2	Input current/voltage range setting 2	
_Fxxyy_IN_RANGE3	Input current/voltage range setting 3	
_Fxxyy_IN_RANGE4	Input current/voltage range setting 4	
_Fxxyy_ERR_CODE	Error code	GET

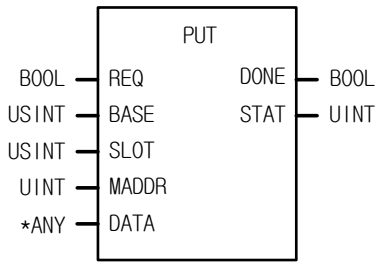
※ At the device allocation, xx means base number and yy means slot number where module is installed

7.2.2 PUT/GET instruction

(1)PUT instruction

PUT

Writing data to special module

Function Block	Description
	**Input** REQ : execute function when 1 BASE : set base position SLOT : set slot position MADDR : module address DATA : data to save module **Output** DONE : Output 1 when normal STAT : Error information

*ANY: WORD, DWORD, INT, USINT, DINT, UDINT type available among ANY type

■ **Function**

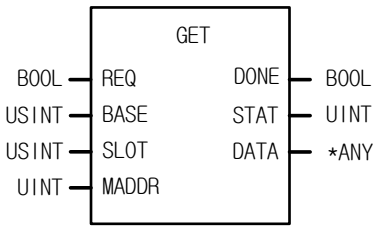
Read data from designated special module

Function Block	Input(ANY) type	Description
PUT_WORD	WORD	Save WRD data into the designated module address (MADDR).
PUT_DWORD	DWORD	Save DWORD data into the designated module address (MADDR).
PUT_INT	INT	Save INT data into the designated module address (MADDR).
PUT_UINT	UINT	Save UNIT data into the designated module address (MADDR).
PUT_DINT	DINT	Save DINT data into the designated module address (MADDR).
PUT_UDINT	UDINT	Save UDINT data into the designated module address (MADDR).

(2) GET instruction

GET

Reading from special module data

Function block	Description
	**Input** REQ : execute function when 1 BASE : set base position SLOT : set slot position MADDR : module address 512(0x200) ~ 1023(0x3FF) **Output** DONE : output 1 when normal STAT : Error information DATA : data to read from module

*ANY: WORD, DWORD, INT, UINT, DINT, UDINT type available among ANY type

■ **Function**

Read data from designated special module

Function Block	Output(ANY) type	Description
GET_WORD	WORD	Read data as much as WORD from the designated module address (MADDR).
GET_DWORD	DWORD	Read data as much as DWORD from the designated module address (MADDR).
GET_INT	INT	Read data as much as INT from the designated Module address (MADDR).
GET_UINT	UINT	Read data as much as UNIT from the designated module address (MADDR).
GET_DINT	DINT	Read data as much as DINT from the designated module address (MADDR).
GET_UDINT	UDINT	Read data as much as UDINT from the designated module address (MADDR).

7.2.3 Example using PUT/GET instruction

(1) Enable channel

(a) You can enable/disable A/D conversion per channel

(b) Disable channel not using to reduce the conversion cycle per channel

(c) When channel is not designated, all channels are set as not used

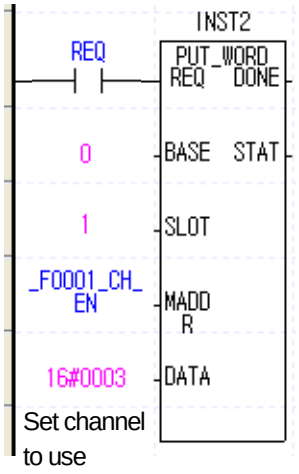
(d) Enable/disable of A/D conversion is as follows

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

Bit	Description
0	Stop
1	Run

16#0003 : 0000 0000 0000 0011

CH3, CH2, CH1, CH0



(e) The value in B4~B15 is ignored.

(f) The right figure is example enabling CH0~CH1 of A/D module equipped at slot 0.

(2) Input voltage/current range setting

(a) You can set input voltage/current range per channel

(b) When analog input range is not set, all channels are set as 1 ~ 5V (4 ~ 20mA)

(c) Setting of analog input voltage/current range is as follows.

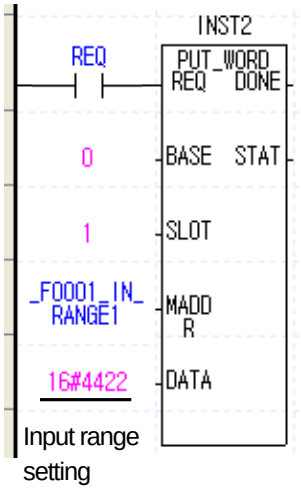
- The following is example setting CH0~CH1 as 1~5V and CH2~CH3 as 0~10V

B15 B14 B13 B12	B11 B10 B9 B8	B7 B6 B5 B4	B3 B2 B1 B0
CH3	CH2	CH1	CH0

Bit	Description
0000	4 mA ~ 20 mA
0001	0 mA ~ 20 mA
0010	1 V ~ 5 V
0011	0 V ~ 5 V
0100	0 V ~ 10 V
0101	-10 V ~ 10 V

16#4422 : 0100 0100 0010 0010

CH3, CH2, CH1, CH0



(3) Out put data range setting

(a) Digital output data range about analog input can be set per channel.

(b) When output data range is not set, all channels are set as -32000~32000.

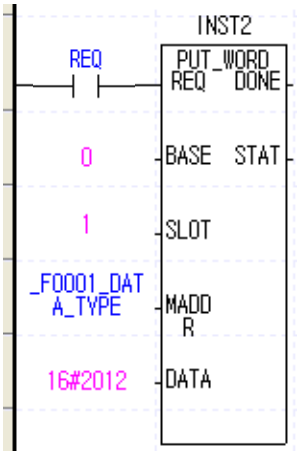
(c) Setting of digital output data range is as follows

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH3				CH2				CH1				CH0			

Bit	Description
00	0~ 16000
01	-8000~8000
10	Precise Value
11	0~10000

16#2012 : 0010 0000 0001 0010

CH3, CH2, CH1, CH0



Precise value has the following digital output range about analog input range

1) Current

Analog input / Digital output	4 ~ 20 mA	0 ~ 20 mA
Precise Value	4000 ~ 20000	0 ~ 20000

2) Voltage

Analog input / Digital output	-10 ~ 10V	0 ~ 10V	0 ~ 5V	1 ~ 5V
Precise Value	-10000 ~ 10000	0 ~ 10000	0 ~ 5000	1000 ~ 5000

(4) Filter process setting

(a) You can enable/disable filter process per channel

(b) Filter process is not set, all channels are set as enable

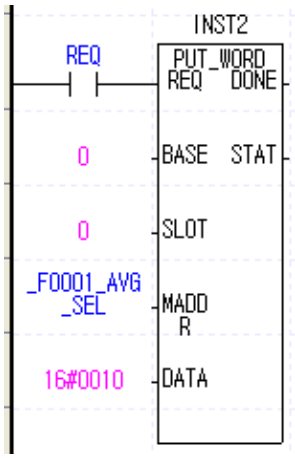
(c) Setting of filter process is as follows

(d) The following figure is example using filter about CH4

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH7		CH6		CH5		CH4		CH3		CH2		CH1		CH0	

Bit	Description
00	0~ 16000
01	-8000~8000
10	Precise Value
11	0~10000

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
CH15		CH14		CH13		CH12		CH11		CH10		CH9		CH8	



16#0010: 0000 0000 0001 0000

CH 3, CH 2, CH 1, CH 0

(5) Filter constant setting

(a) Initial value of filter constant is 0

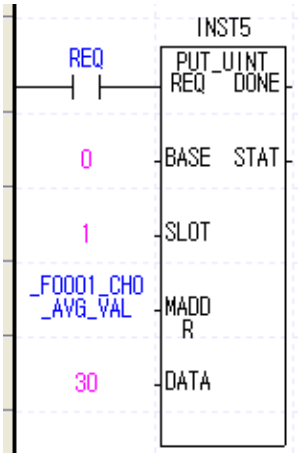
(b) Setting range of filter constant is as follows.

Average method	Setting range
Time average	16 ~16000(ms)
Count average	2 ~ 64000(times)
Weighted average	1 ~ 99(%)

(c) When setting value other than setting range, it indicates error number at error code indication (_F0001_ERR_CODE). At this time, A/D conversion value keeps previous data. (# means the channel where error occurs at error code)

(d) Setting of filter constant is as follows

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
								CH# average value							



Address	Details
9	CH0 average process value setting
10	CH1 average process value setting
11	CH2 average process value setting
12	CH3 average process value setting
13	CH4 average process value setting
14	CH5 average process value setting
15	CH6 average process value setting
16	CH7 average process value setting
17	CH8 average process value setting
18	CH9 average process value setting
19	CH10 average process value setting
20	CH11 average process value setting
21	CH12 average process value setting
22	CH13 average process value setting
23	CH14 average process value setting
24	CH15 average process value setting

Range is different according to average process method

※ At the device allocation, xx means base number and yy means slot number where module is installed

Note

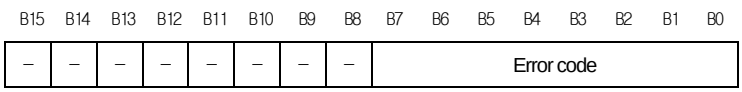
Before you set Time/Count average value, enable the average process and select average method (Time/Count).

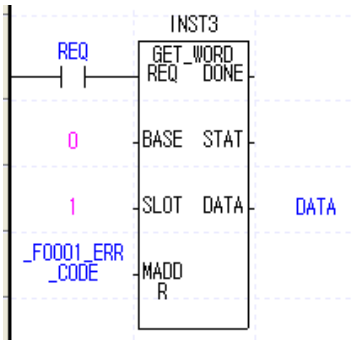
(6) Error code

(a) Saves error code detected at Analog input module

(b) Error type and contents are as follows

(c) The following figure is program example reading error code





Error code (Decimal)	Error contents	Remark
0	Normal RUN	RUN LED on
11	Module error (ASIC RAM or Register error)	RUN LED flickers every 0.2s
20	Module error (A/D Conversion Error)	
1##	Module error (Offset value of 4~20mA range is set as larger or equal than gain value)	RUN LED flickers every 1s
2##	Module error (Offset value of 0~20mA range is set as larger or equal than gain value)	
3##	Module error (Offset value of 1~5V range is set as larger or equal than gain value)	
4##	Module error (Offset value of 0~5V range is set as larger or equal than gain value)	
5##	Module error (Offset value of 0~10V range is set as larger or equal than gain value)	
6##	Module error (Offset value of -10~10V range is set as larger or equal than gain value)	
7##	Time average setting range exceeded	
8##	Count average setting range exceeded	
9##	Weighted average setting range exceeded	

※ At error code, # indicates channel where error occurs

※ For more detail error code, refer to 9.1

(d) In case two error codes occurs, module saves first occurred error code and later occurred error code is not saved

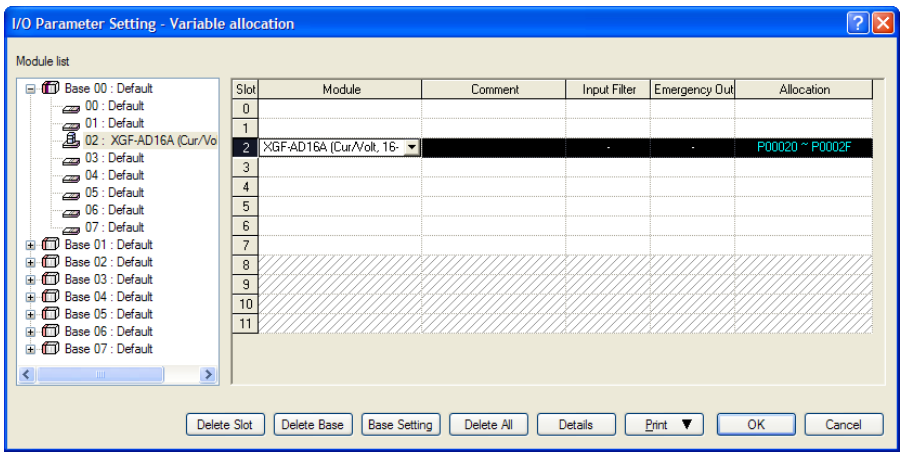
(e) In case error occurs, after modifying error, use “Error clear request flag”(referring to 5.2.5), restart power to delete error code and stop LED flicker

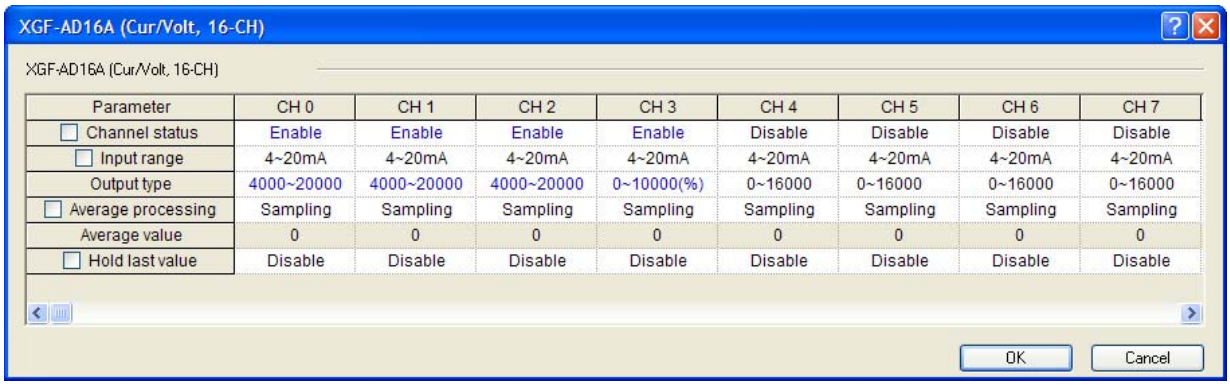
Chapter 8 Programming (For XGI/XGR)

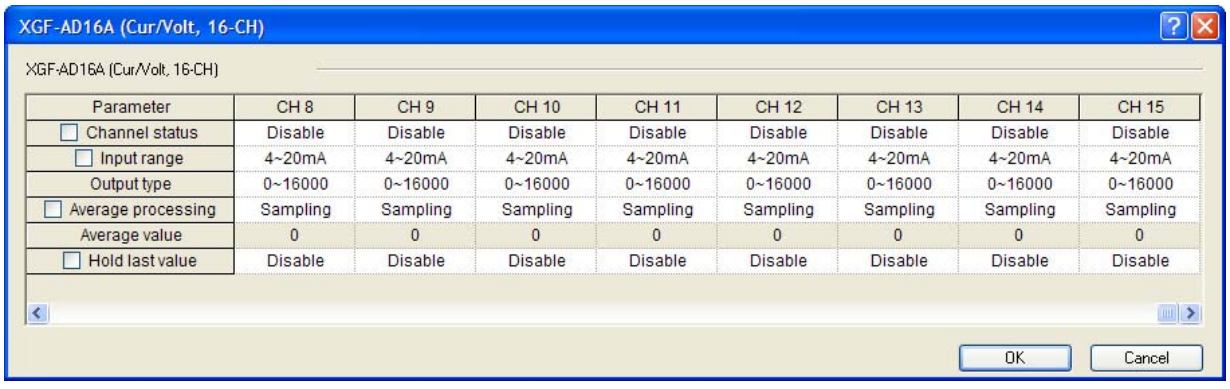
8.1 Basic Program

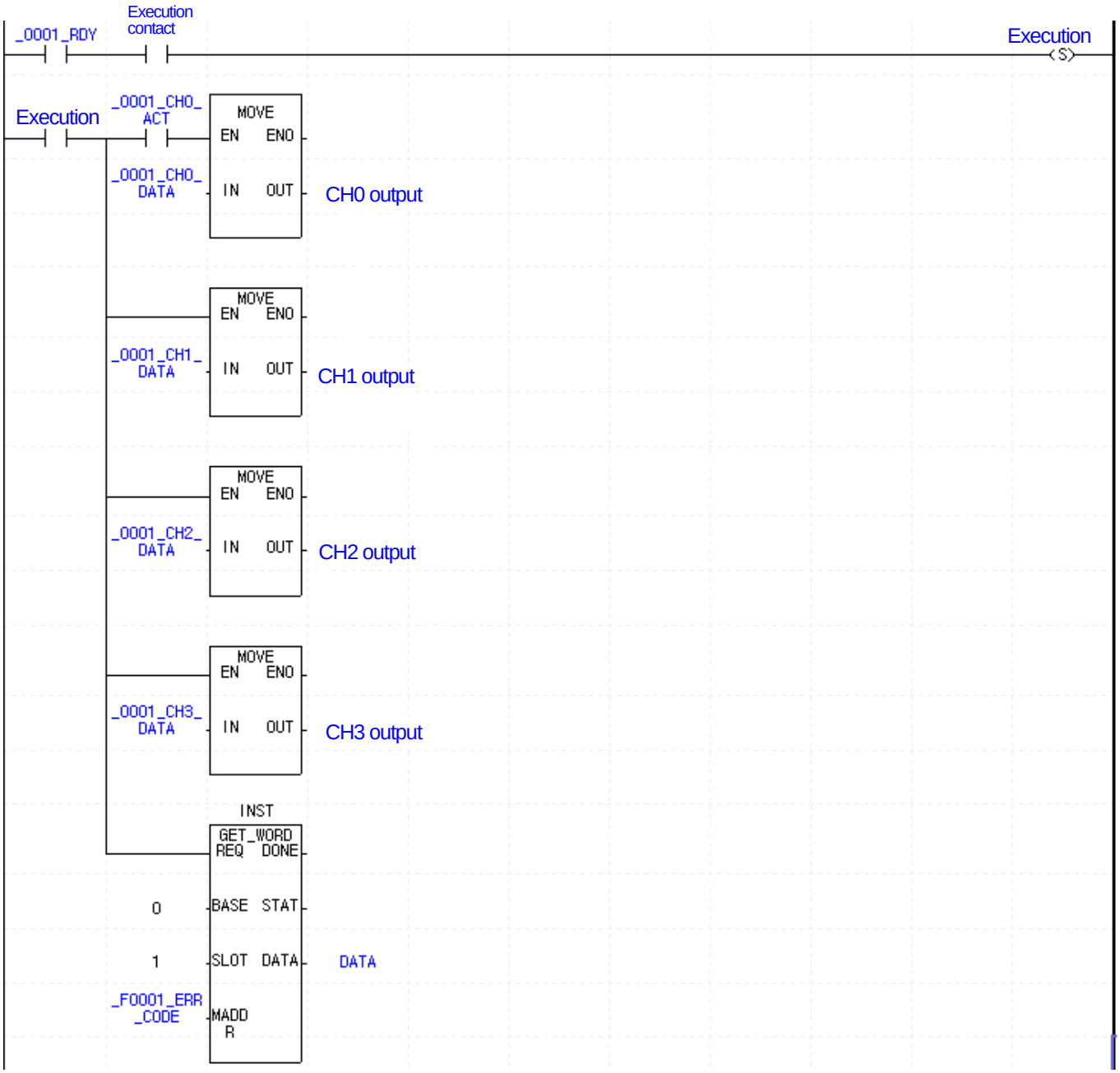
- How to specify Run condition details of Analog input module's internal memory will be described.
- Analog input module is as installed on Slot 2.
- I/O assigned points of Analog input module is 16 points (changeable).
- Initial value specified will be saved on the internal memory of Analog input module through one time of input under the initial setting condition.

8.1.1 Program example using [I/O parameters] setting

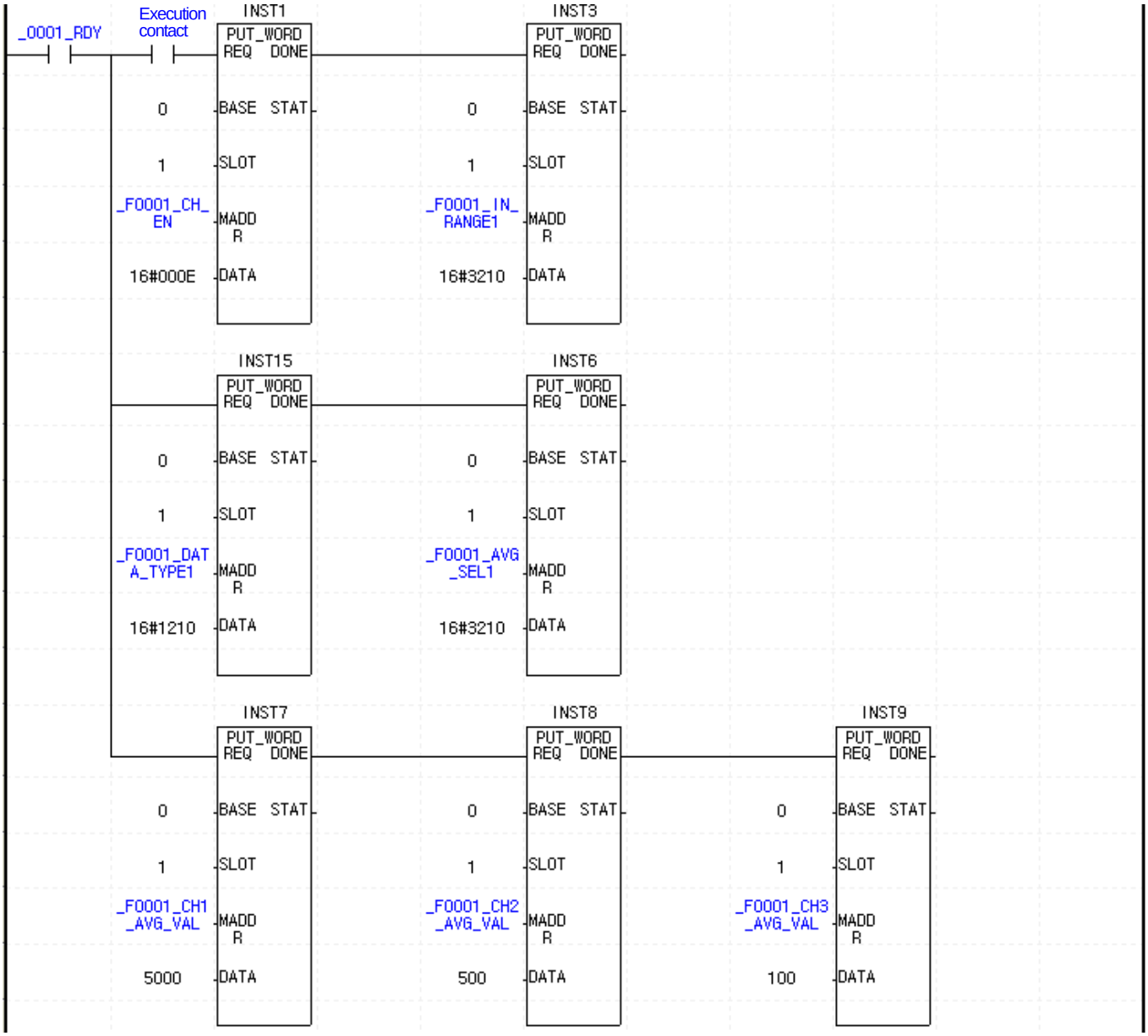


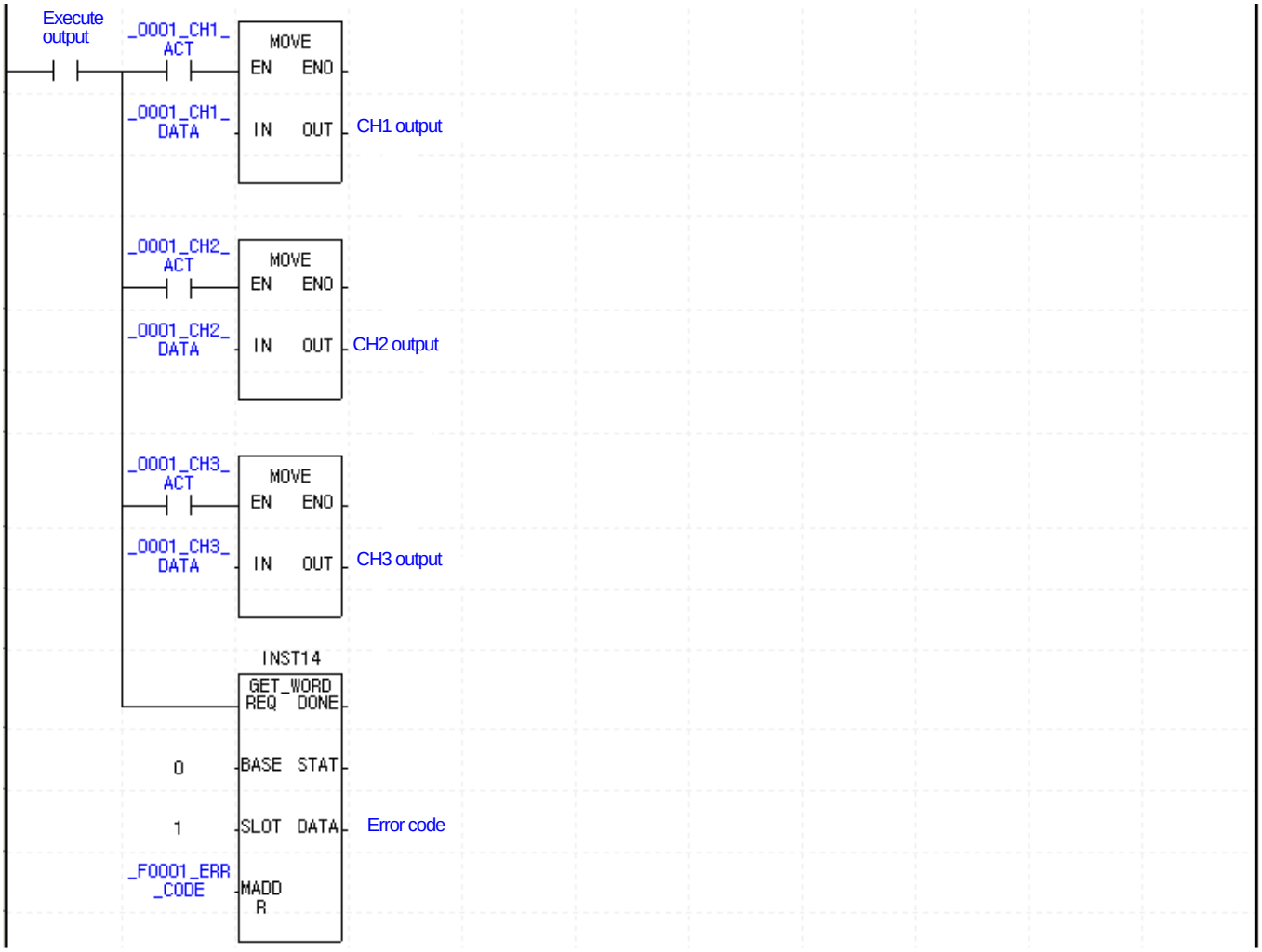





_0001_RDY
Execution contact
Execution
(S)
Execution
_0001_CH0_ACT
MOVE
EN ENO
_0001_CH0_DATA
IN OUT
CH0 output
MOVE
EN ENO
_0001_CH1_DATA
IN OUT
CH1 output
MOVE
EN ENO
_0001_CH2_DATA
IN OUT
CH2 output
MOVE
EN ENO
_0001_CH3_DATA
IN OUT
CH3 output
INST
GET_WORD
REQ DONE
0
BASE STAT
1
SLOT DATA
DATA
_F0001_ERR_CODE
MADDR

8.1.2 Program example using PUT/GET instruction




Execute output
_0001_CH1_ACT
MOVE
EN ENO
_0001_CH1_DATA
IN OUT
CH1 output
_0001_CH2_ACT
MOVE
EN ENO
_0001_CH2_DATA
IN OUT
CH2 output
_0001_CH3_ACT
MOVE
EN ENO
_0001_CH3_DATA
IN OUT
CH3 output
INST14
GET_WORD
REQ DONE
0
BASE STAT
1
SLOT DATA
Error code
_F0001_ERR_CODE
MADDR

8.2 Application Program

8.2.1 Program to sort A/D converted value in size (I/O slot fixed-points assigned: based on 64)

(1) System configuration

XGP-ACF2	XGI-CPUU	XGI-D22A	XGF-AD16A	XGQ-RY2A	

(2) Details of initial setting

No.	Item	Details of initial setting	Internal memory address	Value to write on internal memory
1	Used CH	CH0, CH2, CH3	0	'h000D' or '13'
2	Input range	-10 ~ 10 V	1	'h5505' or '21765'
3	Output data range	-10000 ~ 10000	2	'h0000' or '0'
4	Average process	CH0,2,3(weighted, count, time)	3	'h1204' or '4612'
5	Average value	CH0 weighted averaging value: 50(%)	4	'h0032' or '50'
		CH2 count averaging value: 100(times)	6	'h0064' or '100'
		CH3 time averaging value: 200(ms)	7	'h00C8' or '200'

(3) Program description

(a) If CH 0's digital value is less than 12000, Contact No.0 (%QX0.2.0) of relay output module installed on Slot No.2 will be On

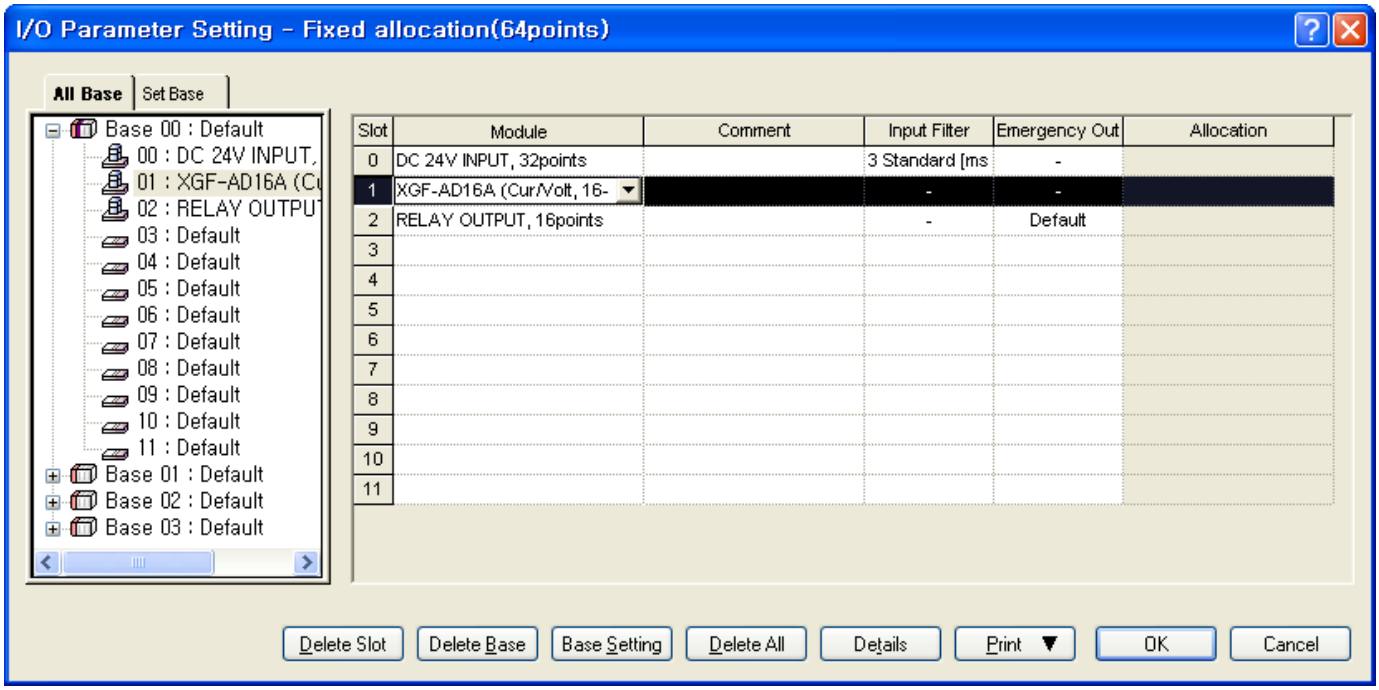
(b) If CH 2's digital value is greater than 13600, Contact No.2 (%QX0.2.2) of relay output module installed on Slot No.2 will be On

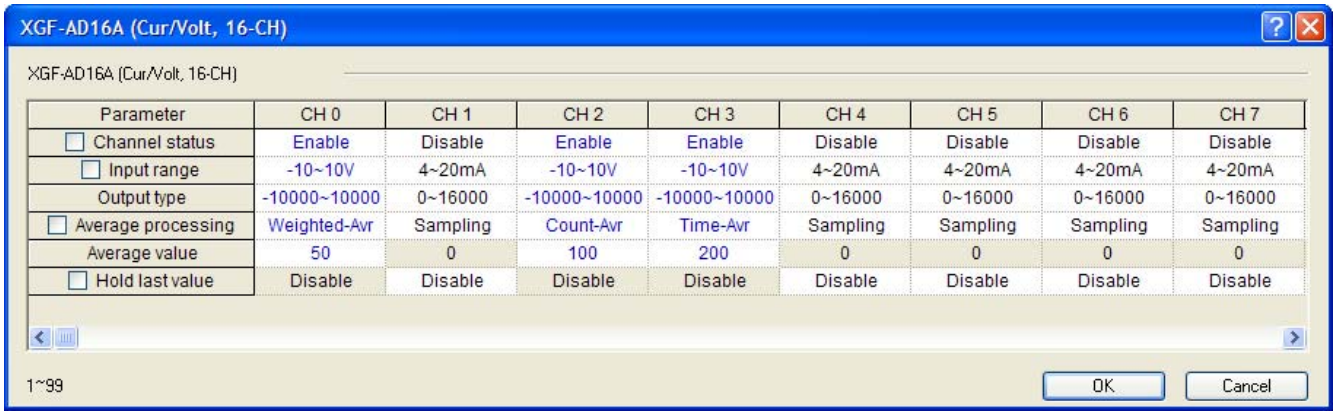
(c) If CH 3's digital value is greater than or equal to 12000 and less than or equal to 13600, Contact No.4 (%QX0.2.4) of relay output module installed on Slot No.2 will be On.

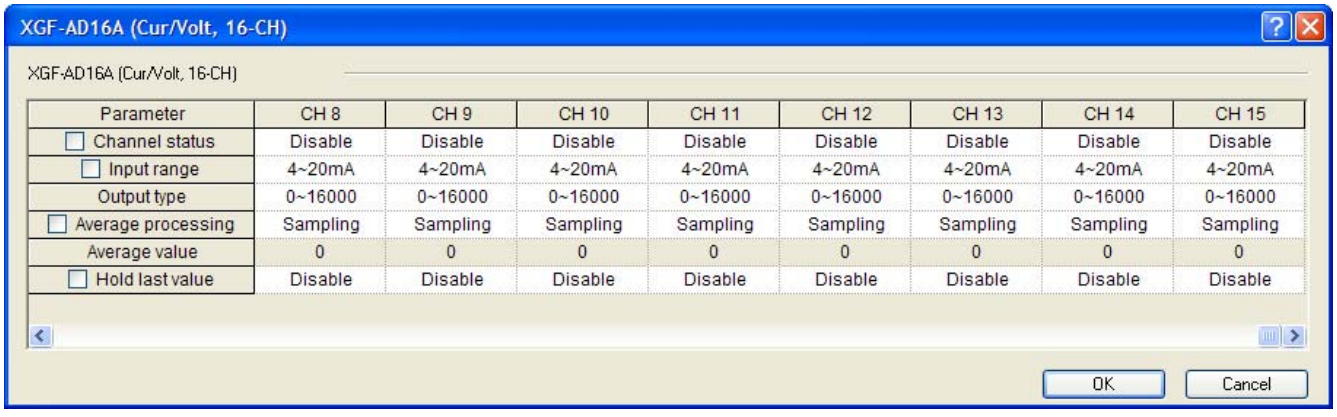
(d) If CH 3's digital value is equal to 13600, Contact No.5 (%QX0.2.5) of relay output module installed on Slot No.2 will be On

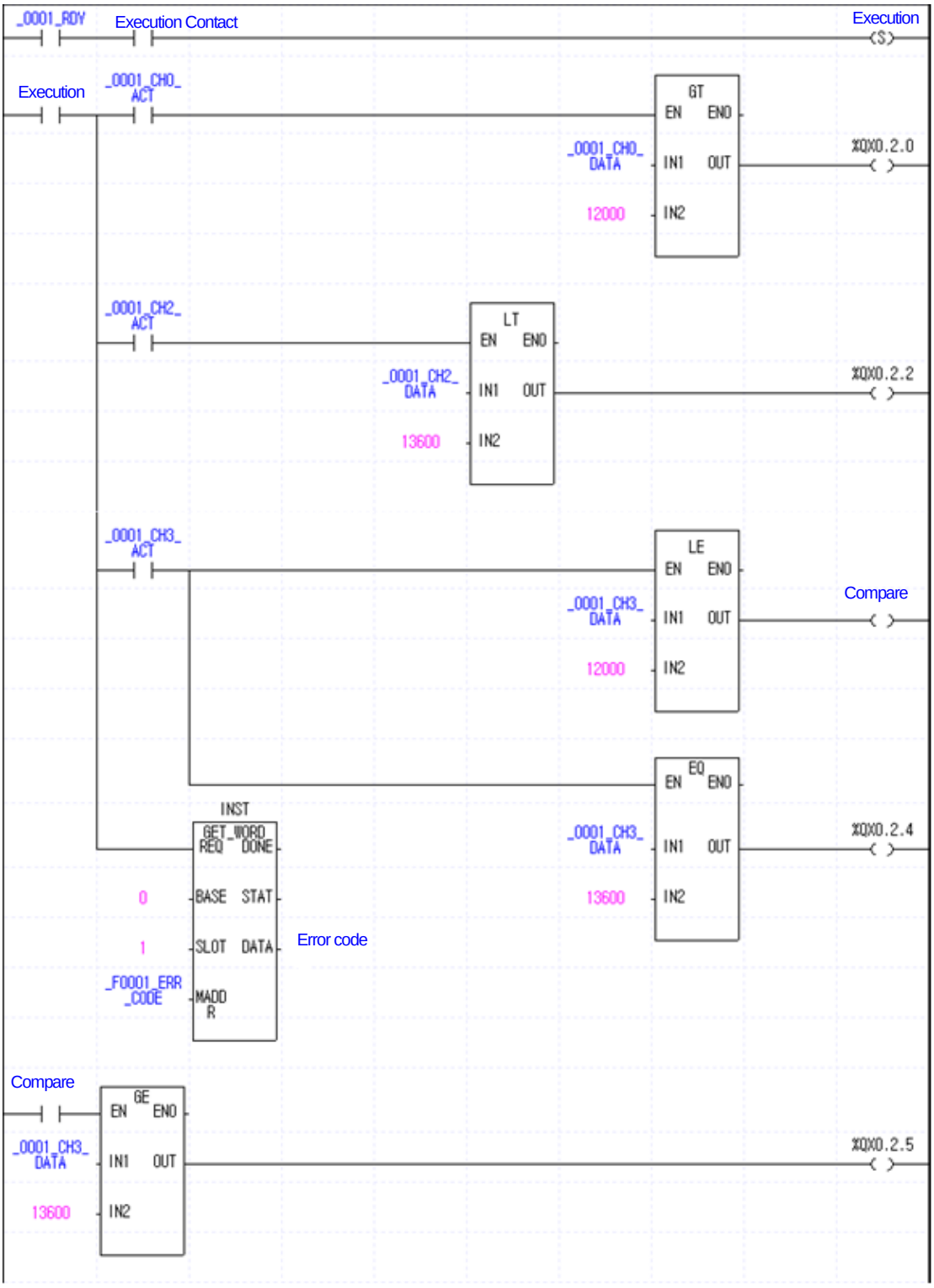
(4) Program

Program example using [I/O parameters] setting



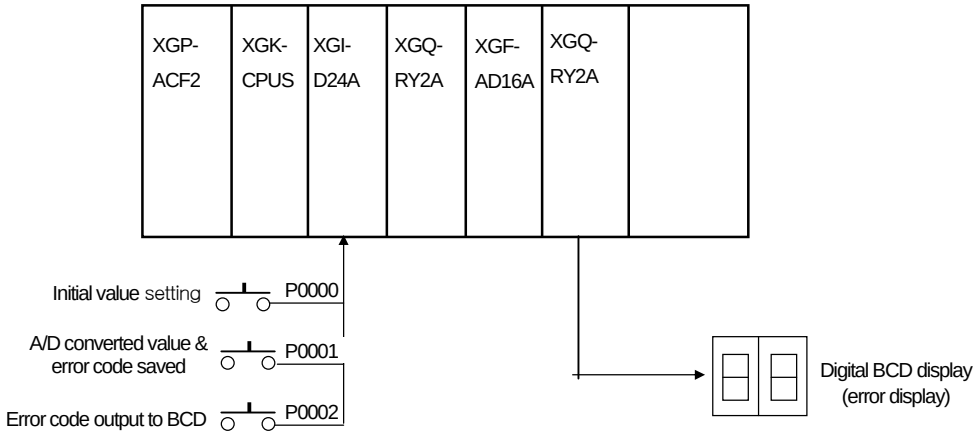





_0001_RDY
Execution Contact
Execution
Execution
_0001_CH0_ACT
GT
EN
ENO
_0001_CH0_DATA
IN1
OUT
%QX0.2.0
12000
IN2
_0001_CH2_ACT
LT
_0001_CH2_DATA
%QX0.2.2
13600
_0001_CH3_ACT
LE
_0001_CH3_DATA
Compare
12000
EQ
INST
GET_WORD
REQ
DONE
0
BASE
STAT
1
SLOT
DATA
Error code
_F0001_ERR_CODE
MADDR
%QX0.2.4
13600
Compare
GE
%QX0.2.5
13600

8.2.2 Program to output error codes of analog input module to BCD display

(1) System configuration



(2) Details of initial setting

(a) Used CH: CH 0

(b) Analog input current range: DC 4 ~ 20 mA

(c) Time average process setting: 100 (ms)

(d) Digital output data range: 0 ~ 16000

(3) Program description

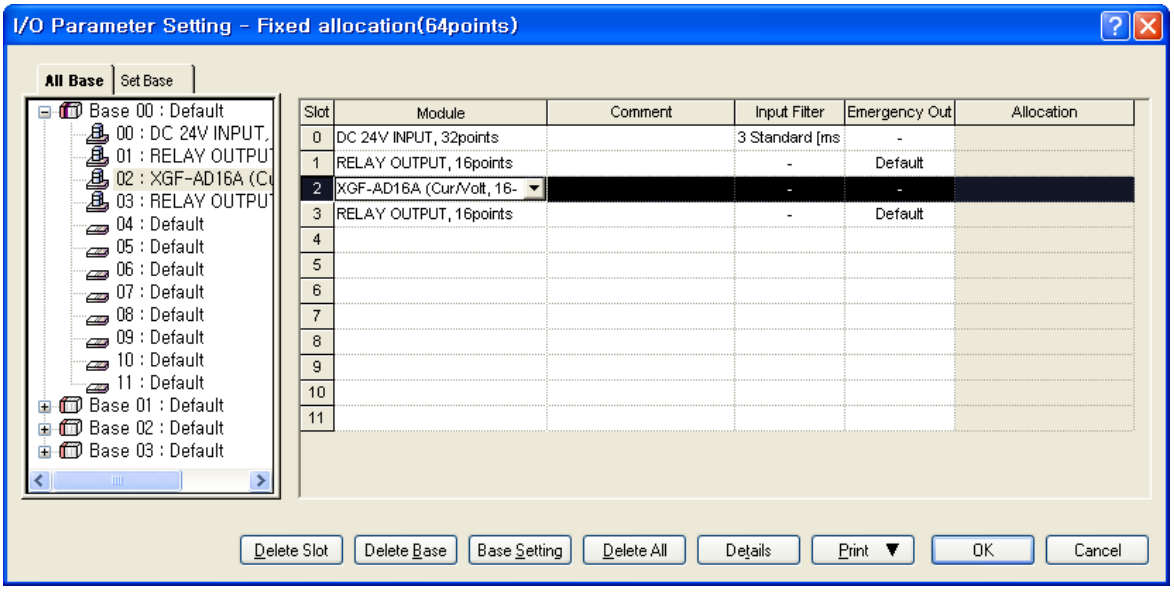
(a) If %IX0.0.0 is on, A/D conversion will be initially specified.

(b) If %IX0.0.1 is on, A/D converted value and error code will be saved respectively on DATA and DATA1.

(c) If %IX0.0.2 is on, applicable error code will be output to digital BCD display (%QW0.3.0).

(4) Program

(a) Program example through [I/O parameters] setting



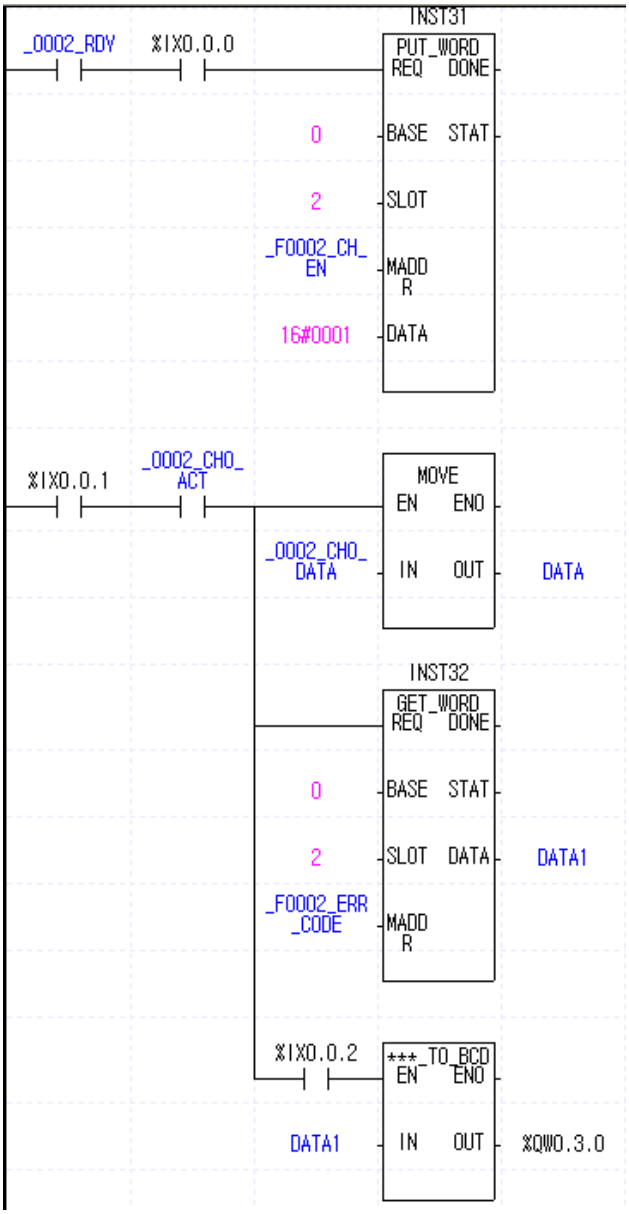
XGF-AD16A (Cur/Volt, 16-CH)

XGF-AD16A (Cur/Volt, 16-CH)

Parameter	CH 0	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7
Channel status	Enable	Disable	Disable	Disable	Disable	Disable	Disable	Disable
Input range	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA	4~20mA
Output type	0~16000	0~16000	0~16000	0~16000	0~16000	0~16000	0~16000	0~16000
Average processing	Time-Avr	Sampling	Sampling	Sampling	Sampling	Sampling	Sampling	Sampling
Average value	100	0	0	0	0	0	0	0
Hold last value	Disable	Disable	Disable	Disable	Disable	Disable	Disable	Disable

16~16000

OK Cancel



Chapter 9 Troubleshooting

Details and diagnosis of errors which occur while analog input module is used will be described.

9.1 Error Codes

Errors which occur when Analog input module's RUN LED blinks are as described in Table 9.1.

Error code detected at analog input module is saved at address 25.

[Table 9. 1] List of error codes

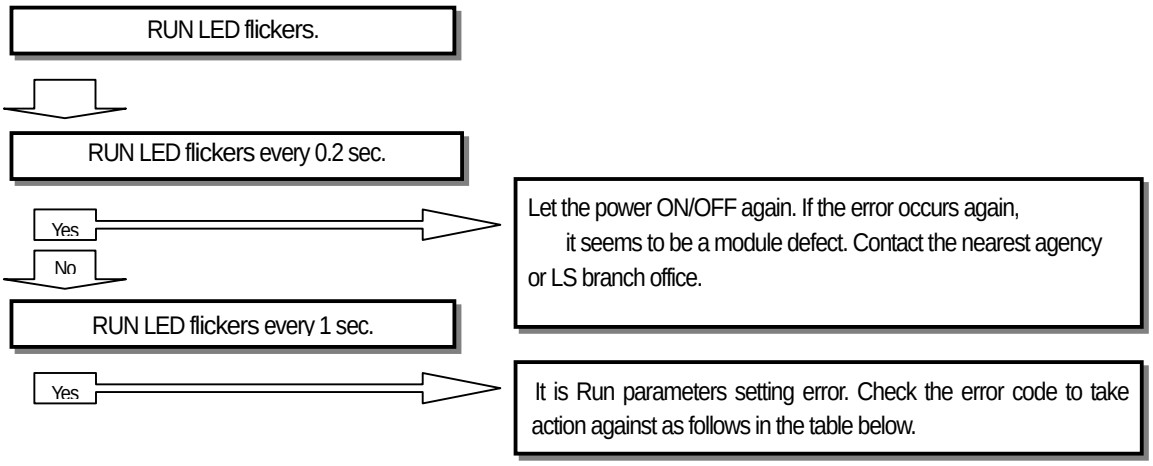
Error code (Dec)	Description	RUN LED status
10	Module error (ASIC Reset Error)	Flickers every 0.2 sec.
11	Module error (ASIC RAM or Register Error)	
20	Module error (A/D Conversion Error)	
30	Module error (EEPROM Error)	
1##	Module error (Offset value with the range of 4 ~ 20 mA is set greater than or equal to Gain value.)	Flickers every 1 sec.
2##	Module error (Offset value with the range of 0 ~ 20 mA is set greater than or equal to Gain value.)	
3##	Module error (Offset value with the range of 1 ~ 5 V is set greater than or equal to Gain value.)	
4##	Module error (Offset value with the range of 0 ~ 5 V is set greater than or equal to Gain value.)	
5##	Module error (Offset value with the range of 0 ~ 10 V is set greater than or equal to Gain value.)	
6##	Module error (Offset value with the range of -10 ~ 10 V is set greater than or equal to Gain value.)	
7##	Time average setting range exceeded	
8##	Count average setting range exceeded	
9##	Weighted average setting range exceeded	

Notes

(1) # of the error code stands for the channel with error found.
(2) If 2 or more errors occur, the module will not save other error codes than the first error code found.
(3) Use the flag to request error clear to delete the error code from the sequence program. (Refer to 9.2.5)

9.2 Troubleshooting

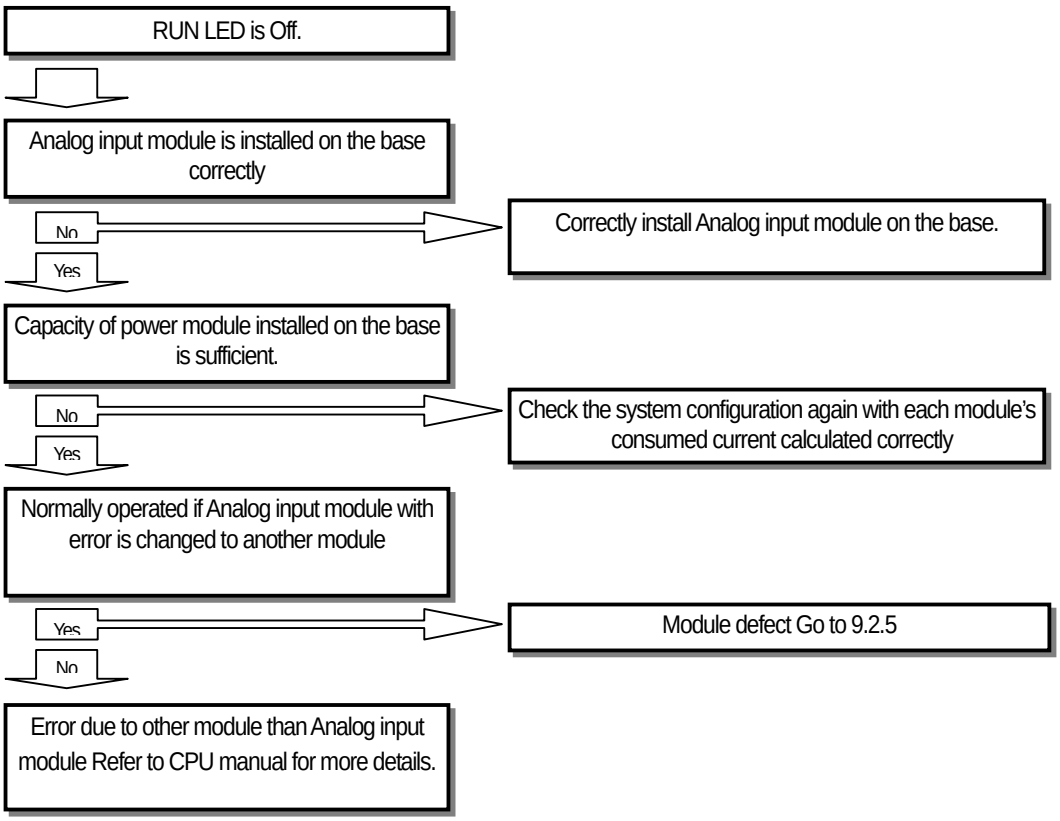
9.2.1 RUN LED blinks



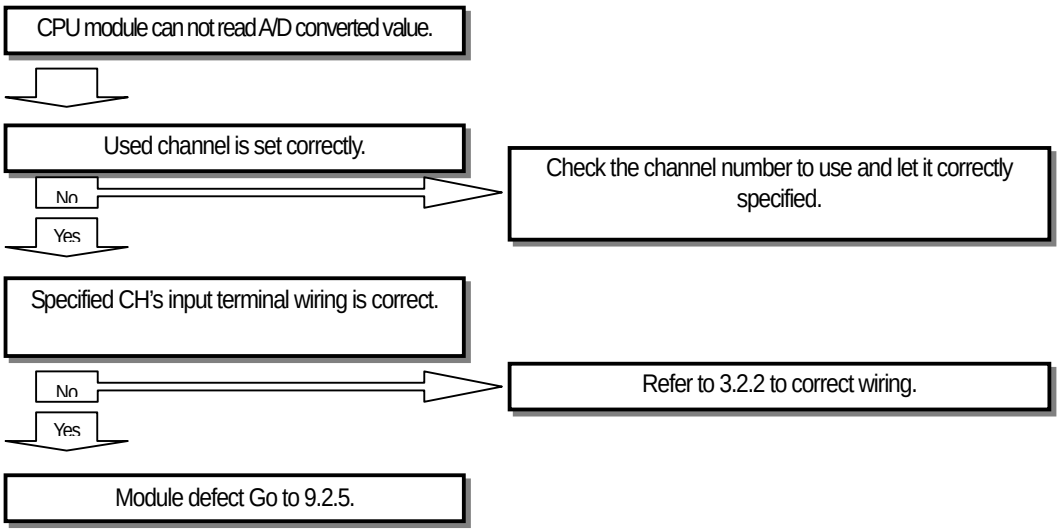
Error Code (Dec)	Error Details	Action
1##	Module Offset/Gain error	Let the power ON/OFF again. If the error occurs again, it seems to be a module defect. Contact the nearest agency or LS branch office.
2##		
3##		
4##		
5##		
6##		
7##	Time average setting range exceeded	Change time average setting value within 16 ~ 16000.
8##	Count average setting range exceeded	Change count average setting value within 2 ~ 64000.
9##	Weighted average setting range exceeded	Change weighted average setting value within 1 ~ 99.

※ # of the error code stands for the channel with error found.

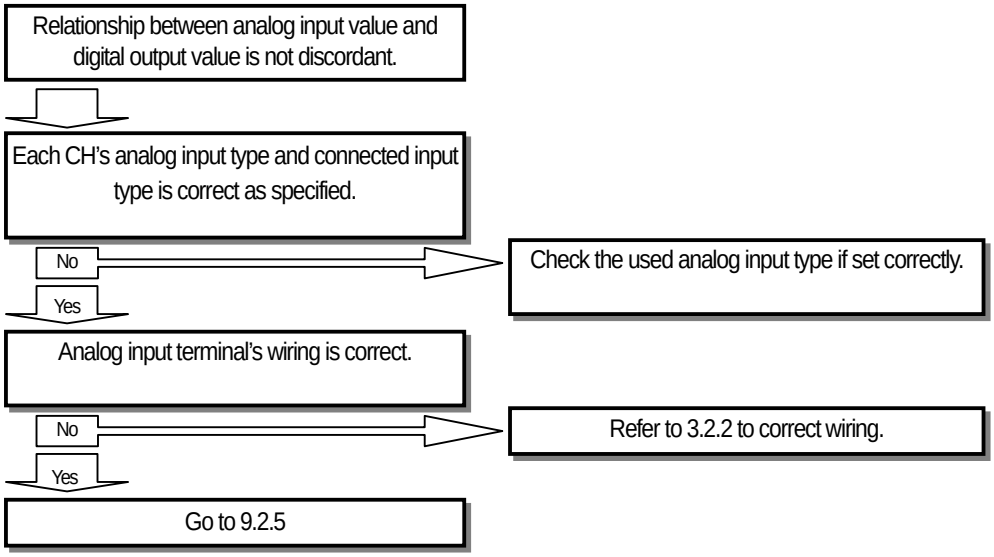
9.2.2 RUN LED is Off



9.2.3 CPU module cannot read A/D converted value



9.2.4 Relationship discordant between analog input value & digital output value



9.2.5 H/W error of Analog input module

Let the power ON/OFF again. If the error occurs again, it seems to be a module defect. Contact the nearest agency or LS branch office.

9.2.6 Status check of Analog input module through XG5000 system monitor

Module type, module information, O/S version and module status of Analog input module can be checked through XG5000 system monitoring function.

1) Execution sequence

Two routes are available for the execution.

(1) [Monitor] -> [System Monitoring] -> And on the module screen, click the right mouse button to display [Module Information].

(2) [Monitor] -> [System Monitoring] -> And Double-click the module screen.

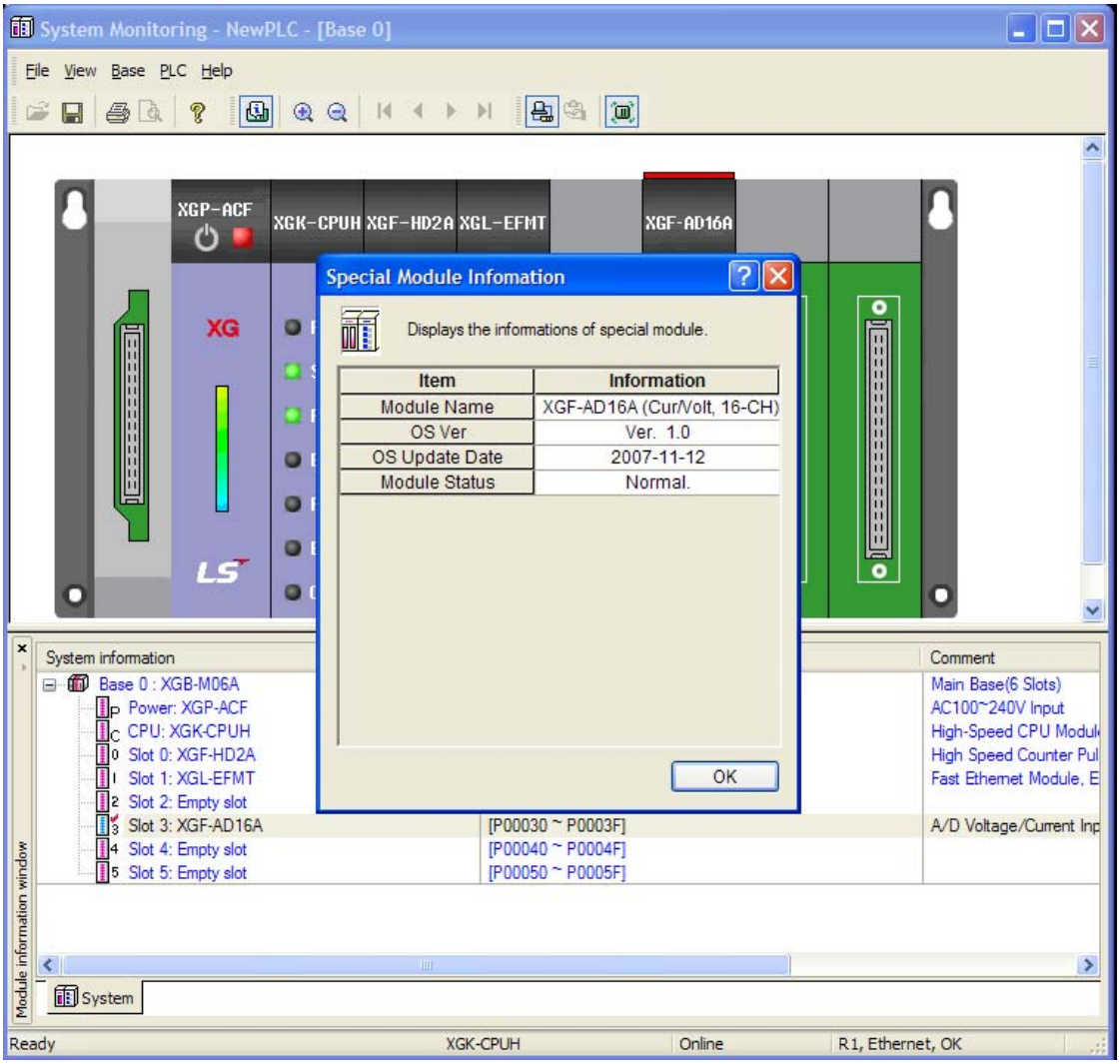
2) Module information

(1) Module type: shows the information of the module presently installed.

(2) Module information: shows the O/S version information of Analog input module.

(3) O/S version: shows the O/S prepared date of Analog input module.

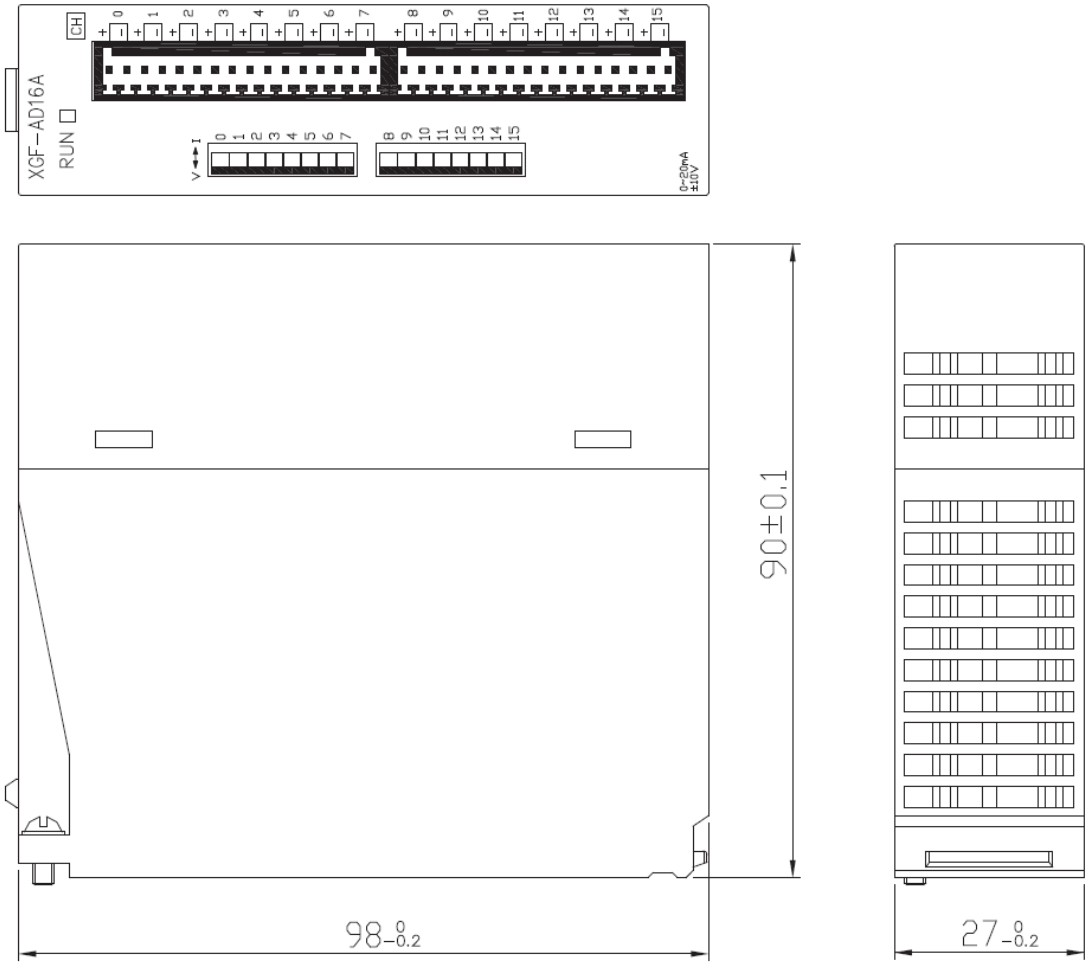
(4) Module status: shows the present error code. (Refer to 9.1 for detailed error codes)


System Monitoring - NewPLC - [Base 0]
File View Base PLC Help
XGP-ACF
XGK-CPUH
XGF-HD2A
XGL-EFMT
XGF-AD16A
XG
LS
Special Module Infomation
Displays the informations of special module.
Item
Information
Module Name
XGF-AD16A (Cur/Volt, 16-CH)
OS Ver
Ver. 1.0
OS Update Date
2007-11-12
Module Status
Normal.
OK
System information
Comment
Base 0 : XGB-M06A
Main Base(6 Slots)
Power: XGP-ACF
AC100~240V Input
CPU: XGK-CPUH
High-Speed CPU Modul
Slot 0: XGF-HD2A
High Speed Counter Pul
Slot 1: XGL-EFMT
Fast Ethernet Module, E
Slot 2: Empty slot
Slot 3: XGF-AD16A
[P00030 ~ P0003F]
A/D Voltage/Current Inp
Slot 4: Empty slot
[P00040 ~ P0004F]
Slot 5: Empty slot
[P00050 ~ P0005F]
Module information window
System
Ready
XGK-CPUH
Online
R1, Ethernet, OK

Appendix 1 Dimension

Appendix 1.1 Dimension

Unit: mm



Warranty

1. Warranty Period

The product you purchased will be guaranteed for 18 months from the date of manufacturing.

2. Scope of Warranty

Any trouble or defect occurring for the above-mentioned period will be partially replaced or repaired. However, please note the following cases will be excluded from the scope of warranty.

(1) Any trouble attributable to unreasonable condition, environment or handling otherwise specified in the manual,
(2) Any trouble attributable to others' products,
(3) If the product is modified or repaired in any other place not designated by the company,
(4) Due to unintended purposes
(5) Owing to the reasons unexpected at the level of the contemporary science and technology when delivered.
(6) Not attributable to the company; for instance, natural disasters or fire

3. Since the above warranty is limited to PLC unit only, make sure to use the product considering the safety for system configuration or applications.

Environmental Policy

LS Industrial Systems Co., Ltd supports and observes the environmental policy as below.

Environmental Management

LS Industrial Systems considers the environmental preservation as the preferential management subject and every staff of LS Industrial Systems use the reasonable endeavors for the pleasurably environmental preservation of the earth.

About Disposal

LS Industrial Systems' PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.

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2009. 9